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MINERALOGICAL ABSTRACTS

Vol. 14—No. 5 March 1960

AGE DETERMINATION AND ISOTOPE MINERALOGY

Stieff (L. R.), Stern (T. W.), Oshiro (S.), & Senftle (F. E.). *Tables for the calculation of lead isotope ages.* Prof. Paper U.S. Geol. Survey, 1959, **334–A**, 1–40.

Tables are presented for calculating geological age by using the atomic ratios $^{206}Pb/^{238}U$, $^{207}Pb/^{235}U$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{232}Th$. Tables of values of N_d/N_p and t are given for the age equation $N_d/N_p = \exp\lambda t - 1$, where λ is the decay constant, t the age in 10^6 years, N_d the number of atoms of daughter products, and N_p the number of atoms of parent. Values for N_{207}/N_{206} and t are also given in tabular form for the equation

$$N_{207}/N_{206} = (\exp\lambda_{235}t - 1)/k(\exp\lambda_{238}t - 1)$$

where N_{207} and N_{206} are the number of atoms of radiogenic ^{207}Pb and ^{206}Pb respectively; k, the present-day atomic ratio $^{238}U/^{235}U$, is taken as 137·7. The half lives (T) of ^{238}U, ^{235}U, and ^{232}Th used in the calculations are: T_{238} $4{\cdot}51 \times 10^9$, T_{235} $7{\cdot}13 \times 10^8$, T_{232} $1{\cdot}42 \times 10^{10}$ years. The tables cover selected values of t from 1 to 6,000 m.y. at intervals of t ranging from 1 to 15 m.y. Only the calculated errors in t which result from experimental uncertainties in the determinations of the decay constants and relative abundance of ^{238}U and ^{235}U have been included. An example (hypothetical) is given of an age calculation by use of the tables. K. S.

Mayne (K. I.), Lambert (R. St J.), & York (D.). *The geological time-scale.* Nature, 1959, **183**, 212–214, 1 fig.

Using argon-potassium methods on biotite and feldspar from some coarse-grained granitic rocks, and taking other data from published and unpublished work, the authors have modified the Holmes scale B of absolute geological time. Approximate values for the time-scale proposed are: Cambrian ≈ 750–650, Ordovician ≈ 650–540, Silurian 540–490, Devonian 490–400, Carboniferous 400–300, Permian 300–250, Trias 250–180, Jurassic 180–140, Cretaceous 140–60, and Tertiary 60–0 m.y. M. J. Le B.

Davidson (C. F.). *How old is the Cambrian system?* Nature, 1959, **183**, 768–9.

Using chemical and stratigraphical data, the usefulness of the Swedish kolm as a geochronological date-line is shown to have limitations. Russian and African published work is quoted, and it is deduced that the base of the Cambrian is dated at about 600 m.y. M. J. Le B.

Mayne (K. I.), Lambert (R. StJ.), & York (D.). [*Reply to Davidson (C. F.).* Nature, 1959, **183**, 768–9.] Nature, 1959, **183**, 769–770.

It is shown that the samples made use of for dating, the figure assumed for the percentage loss of argon, and other factors used by Davidson, are open to criticism. [M.A. **13**–503.] M. J. Le B.

Long (Leon E.), Kulp (J. Laurence), & Eckelmann (F. Donald). *Chronology of major metamorphic events in the southeastern United States.* Amer. Journ. Sci., 1959, **257**, 583–603, 3 figs., 3 tables.

Potassium-argon and rubidium-strontium age measurements tabulated for various rocks in the Piedmont and Blue Ridge regions show strong evidence for metamorphic episodes 350 and 1000 m.y. ago. An additional metamorphic episode is postulated between these, and in the Piedmont area of Georgia and South Carolina there was probably a fourth orogeny 230 to 310 m.y. ago. H. W.

Hurley (P. M.), Boucot (A. J.), Albee (A. L.), Faul (Henry), Pinson (W. H.), & Fairbairn (H. W.). *Minimum age of the Lower Devonian slate near Jackman, Maine.* Bull. Geol. Soc. America, 1959, **70**, 947–950.

A quartz-monzonite stock near Jackman, north-western Maine, intrudes fossiliferous Lower Devonian (Oriskany) slate, fossiliferous Upper Silurian conglomerate and calcareous sandstone, and pre-Upper Silurian porphyritic quartz-monzonite. On biotite from the post-Oriskany intrusion, K–A measurements by two laboratories gave ages of 364±10 m.y. and 353±10 m.y., and a Rb–Sr measurement 360±28 m.y. On biotite from the pre-Upper Silurian intrusion, K–A measurements by two laboratories gave 356±15 m.y. and 366±10 m.y. K–A measurements on fossiliferous cordierite hornfels gave 365±10 m.y., and on 3 samples of Oriskany shale 350±15, 368±15, and 377±18

m.y. It is concluded that the age of the younger quartz-monzonite and the associated metamorphism of the slates and older quartz-monzonite is at least 360 m.y.; this is therefore a minimum age for Oriskany time. A. L. A.

Goldich (S. S.), Nier (A. O.), & Washburn (A. L.). *A^{40}/K^{40} age of gneiss from McMurdo Sound, Antarctica.* Trans. Amer. Geophys. Union, 1958, **39**, 956–958, 1 fig.

Biotite from gneiss of Gneiss Point, McMurdo Sound, Antarctica, is dated at 520 m.y. by the $^{40}A/^{40}K$ method. The gneiss is associated with limestones, amphibolites, and hornblende schists. F. R. B.

Gast (P. W.), Kulp (J. L.), & Long (L. E.). *Absolute age of early Precambrian rocks in the Bighorn Basin of Wyoming and Montana, and southeastern Manitoba.* Trans. Amer. Geophys. Union, 1958, **39**, 322–334, 2 figs.

K–A and Rb–Sr methods are used to determine ages of micas and feldspars from the basement rocks surrounding the Bighorn Basin, and from pegmatites and gneisses in the Winnipeg River–Johnston Lake area, southeastern Manitoba. Pb–U ages are also given for uraninite from pegmatite in the Bighorn area. The absolute age of the pegmatites and gneisses from the Bighorn area is found to be 2750 ± 150 m.y.; the Manitoba rocks have an age of 2650 ± 150 m.y. A similar age is found for a muscovite from the northwestern angle region of Minnesota. K–A ages are found to be lower and less consistent than the Rb–Sr ages. F. R. B.

Polkanov (A. A.) & Gerling (E. K.). *K–A and Rb–Sr methods and age of Precambrian of U.S.S.R.* Trans. Amer. Geophys. Union, 1958, **39**, 713–715.

Procedure and results of K–A age determinations made by the authors since 1951 are summarized. Thirty-five ages of micas from Precambrian rocks of the U.S.S.R. range from 337 to 2880 m.y. Rb–Sr ages are given for two of these samples. F. R. B.

Schreiner (G. D. L.) & van Niekerk (C. B.). *The age of a Pilanesberg dyke from the central Witwatersrand.* Trans. Geol. Soc. S. Africa, 1958, **61**, 198–203. [Discussion and authors' reply, 205–207.]

Rb–Sr age measurements indicate an age of 1290 ± 18 m.y. for the dyke. The results and their stratigraphical implications are discussed. E. S. W. S.

Nicolaysen (L. O.), de Villiers (J. W. L.), Burger (A. J.) & Strelow (F. W. E.). *New measurements relating to the absolute age of the Transvaal System and of the Bushveld Igneous Complex.* Trans. Geol. Soc. S. Africa, 1958, **61**, 137–163, 2 pls., 6 figs. [Discussion and authors' reply, 165–166.]

Complete analytical data, techniques, and decay constants used, and petrographic descriptions of parent rock specimens are given in relation to the following: (1) Rb–Sr age measurements on three micas from Bushveld granites and on one from a biotite-bearing pyroxenitic gabbro, (2) U–Pb and Th–Pb age measurements on six monazites from Houtenbek 392, (3) U–Pb age measurements on three zircon concentrates from Bushveld granite, and (4) lead isotopic compositions of galenas emplaced within sediments of the Transvaal System. The data are critically discussed and are consistent with an age of 1950 ± 150 m.y. for the emplacement of the Bushveld Complex. E. S. W. S.

Moorbath (S.), Taylor (S. R.), & Upton (B. G. J.). *Age of zircon from the Kunait syenite complex, south-west Greenland.* Geol. Mag., 1958, **95**, 149–152.

A Pb/α determination gave 497 m.y. R. St J. L.

Saillard (Nicole), Scheibling (Gaston), & Hee (Arlette). *Sur la détermination de la teneur en plomb des zircons par une méthode spectrographique.* C.R. Acad. Sci. 1957, **244**, 609–611.

E. J.

Hee (Arlette) & Flesh (Louis). *Age absolu apparent des zircons d'Espaly (Haute Loire).* C.R. Acad. Sci., 1957, **244**, 1796–1798.

Contradictions appear between the age measurements made by Lord Rayleigh on these zircons ($6{\cdot}3 \times 10^6$ years) and those made by the authors (140×10^6 years). Various comparative measurements are given and hypotheses to explain the difference are advanced. E. J.

APPARATUS AND TECHNIQUES

Optical, X-ray, and others

Smithson (F.). *A simple spectroscopic eye-piece for testing monazite under the microscope.* Min. Mag., 1959, **32**, 176.

A micrometer eye-piece may be converted into a spectroscope eye-piece by replacing the micrometer disc by a suitable stop and using a small liquid prism over the upper lens. For monazite the absorption band in the yellow is sharply defined. R. A. H.

Watkins (J. S., *Jr.*). *Graphs for the elimination of the Hartmann net in the determination of refractive indices in high dispersion media.* Amer. Min., 1959, **44**, 314–321, 7 figs.

Direct-reading graphs are given for determining refr. ind. (D line) and dispersion of a mineral using the double dispersion method. Constructions and proofs are briefly given and the errors estimated as less than 0·0004 for N_D and less than

001 for dispersion. A similar graph is given for plagioclase ...lating α' and composition. B. H. B.

...owell (J. E.) & Dawson (K. R.). *Technique for optical identification of iron-bearing dolomites.* Canad. Min., 1958, **6**, 292–294, 1 fig.

The technique involves the rotation of a grain in thin ...ection on the universal stage about a horizontal optic ...irection until the refr. ind. agrees with that of the adjacent ...anada balsam. A curve relates the composition to the ...ngle of rotation. R. B. F.

...ohn (J. W.) & Fullman (R. L.). *On the use of lineal analysis for obtaining particle size distribution functions in opaque samples.* Journ. Metals, 1956, **8** (5), 610–612.

A method is derived for obtaining the distribution of ...phere diameters and of platelet thicknesses from size ...distribution functions obtained along randomly oriented ...ines. The authors claim for their method several advantages ...ver existing methods. R. G. Wls.

Beugnies (A.). *Phénomènes d'optique cristalline observables par réflexion convergente de la lumière sur les surfaces polies. Etude théorique et expérimentale.* Bull. Soc. belge Géol., 1958, **67**, 489–519, 7 figs., 1 table.

A mathematical explanation of the figures obtained using a high power objective and convergent polarised reflected light and recognized already, notably by E. N. Cameron and L. H. Green [Econ. Geol., 1950, **45**, 719], in monochromatic as well as in white light. The effects of strain in the objective lenses are studied and the use of the figures for determination of some properties, isotropy or anisotropy, degree of anisotropy, &c., is shown. F. Sch.

Herbstein (F. H.). *Precision determination of cell dimensions by the back-reflexion Weissenberg method.* Nature, 1957, **180**, 291–292.

Conventional front-reflexion cameras can easily be converted to back-reflexion instruments. An accuracy of $\pm 0{\cdot}0025\%$ is claimed for cell-dimensions determined in this way in favourable instances. D. McK.

Donnay (Gabrielle) & Smith (Joseph G.). *Calibration sights for X-ray powder camera.* Amer. Min., 1959, **44**, 196–199, 2 figs.

The use of calibration sights on an X-ray powder camera is described. Calibration sights permit determination of film shrinkage by direct measurement and centering of the film on the measuring device, thus simplifying the calculations. A. C. H.

Fridrichsons (J.). *Calibration of single-crystal Weissenberg films.* Amer. Min., 1959, **44**, 200–201, 1 fig.

The crystal is mounted on a thin wire (0·1 mm) of pure metal with accurately known spacing values (Ag, Al, Pt). The drawn out powder lines of the metal are superimposed on the Weissenberg pattern of the crystal over the whole width of the film thus giving a reference calibration. A. C. H.

Buckenham (M. H.) & Rogers (J.). *Flotation of quartz and felspar by dodecylamine.* Trans. Inst. Mining & Metall., London, 1955, **64**, 11–33.

Quartz and the alkali feldspars show practically identical response to solutions of dodecylamine hydrochloride between pH 4 and pH 12, but the calcium feldspars respond less readily and over a narrower range of pH. The addition of 6 mg/litre of sodium metaphosphate glass is sufficient to depress the minerals except at pH 12. The activation of feldspar by sodium fluoride in acid solutions is considered to be due to the formation at the mineral surface of a complex aluminium fluoride at which sites the dodecylamine ion is adsorbed. R. A. H.

Plaksin (I. N.), Zaitseva (S. P.), Myasnikova (G. A.), Starchik (L. P.), Turnikova (V. I.), Khazhinskaya (G. N.), & Shaefeyev (R. S.). *Microradiographic study of the action of flotation reagents.* Trans. Inst. Mining & Metall., London, 1958, **67**, 1–7, 1 fig., 4 pls.

Microradiography has been used to study the distribution of radioactive matter on the surface of a mineral particle as well as to record natural radioactive elements present in the mineral itself. The Institute of Mining of the Academy of Sciences of the U.S.S.R. has applied the method to studies of the adhesion of various flotation reagents to the surface of mineral particles. R. A. H.

Wunderlich (J. A.). *Une méthode rapide pour mesurer la densité d'un cristal.* Bull. Soc. franç. Min. Crist., 1958, **81**, 220–223, 1 fig.

Describes apparatus and method for measuring the density of a crystal grain with accuracy of about 0·01 g/cm^3. The crystal is made to float in a liquid by regulating the temperature ; the densities of various liquids over a wide temperature range are given in a table. The method is applicable to densities between 0·8 and 2·5 g/cm^3 and temperatures between $-110°$ and 200°C. [M.A. **12**–316] J. Z.

Lamar (J. E.). *Acid etching in the study of limestones and dolomites.* Illinois State Geol. Survey, 1950, Circ. 156, 47.

Limestones and dolomites were etched with HCl, acetic,

and various organic and mineral acids. Acetic acid gives a rougher surface than HCl to limestones but either acid works equally well with dolomites. Etching by acetic acid seems to depend on the porosity, grain size, and relative purity of the limestone and to take place most readily along incipient fractures and grain contacts. Organic acids behave similarly to acetic and mineral acids similarly to HCl, except in the cases of sulphuric and oxalic acids which form insoluble products. On etching, dolomite, clay, silt, sand, and chert stand in relief ; some parts of crystals or ooliths dissolve more rapidly than other parts. W. A. Wh.

Dooley (J. R., *Jr.*). *The radioluxograph : a fast, simple type of autoradiograph.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 550–553, 2 figs.

Transparent adhesive tape on which a ZnS.Ag phosphor has been dusted is placed between the flat surface of a radioactive specimen and a high-speed photographic film. On processing, a clear radiograph is obtained after an exposure of a few minutes or hours depending on the radioactivity. A self-processing camera and film may be used.

J. E. T. H.

Bidgood (D. E. T.) & Harland (W. B.). *Rock compass : a new aid for collecting oriented specimens.* Bull. Geol. Soc. America, 1959, **70**, 641–644, 2 figs.

A. L. A.

Chemical, spectrometric, polarographic

Riley (J. P.) & Williams (H. P.). *The microanalysis of silicate and carbonate minerals. I. Determination of ferrous iron.* Mikrochim. Acta, 1959, 516–524, 1 fig.

A method is described for the determination of FeO in 3 to 5 mg samples of silicate and carbonate minerals and rocks. The sample is decomposed in a stoppered polytetrafluoroethylene (*Teflon*) tube by heating for 40 minutes at 100°C with an H_2SO_4–HF mixture. After cooling the solution is treated with 2,2′-dipyridyl and adjusted to pH 5·0, and FeO is estimated spectrophotometrically as the red ferrous-dipyridyl complex. At around 9% FeO a standard deviation of $\pm$0·07% FeO was found : values for G–1 and W–1 were 0·93 and 8·74% respectively. [M.A. **13**–257, **14**–5] R. A. H.

Riley (J. P.) & Williams (H. P.). *The microanalysis of silicate and carbonate minerals. II. The determination of water and carbon dioxide.* Mikrochim. Acta, 1959, 525–535, 1 fig.

A method previously described [M.A. **14**–5] for the simultaneous determination of H_2O and CO_2 in rocks and minerals has been substantially modified and developed for use with a 10 mg sample. The method showed a standard deviation of $\pm$0·05% H_2O for a biotite schist with 4·1% H_2O, and $\pm$0·24% CO_2 for a limestone with about 43% CO_2.

R. A. H.

Toerien (F. v. S.). *A rapid volumetric method for determining copper in a carbonatite ore.* Analyst, 1959, **8**[illegible] 565–567.

The ore is decomposed with a mixture of concentrated nitric, orthophosphoric, and perchloric acids, the salts are dissolved by boiling in distilled water, the permanganic acid formed is reduced by oxalic acid, and iron is complexed with sodium fluoride. The pH of the solution is then adjusted to between 2·5 and 3 with sodium acetate solution and the Cu is determined iodimetrically. R. A. H.

Povondra (P.) & Vébr (J.). [*Industrial analysis of natural fluorites.* Chem. Listy, 1958, **52**, 2008–2009.] Anal. Abstr., 1959, **6**, abstr. 2997.

The decomposition of fluorite with a mixture of boric and perchloric acids enables F to be readily separated in the form of a fluoroborate complex. The determination of Si, Ba, and Ca is described. R. A. H.

Skřivánek (V.). [*Analysis of fluorite containing large amounts of galena.* Chem. Listy. 1958, **52**, 1827–1828] Anal. Abstr., 1959, **6**, abstr. 2183.

A mixture of HCl, H_3BO_3, and $KClO_3$ is used for the decomposition of the sample, and EDTA is used for masking Pb, Fe, Al, Mn, Zn, and Mg. Ca is determined as oxalate.

R. A. H.

Headridge (J. B.) & Magee (R. J.). *The spectrophotometric determination of alkaline-earth metals after separation by paper chromatography.* Talanta, 1958, [illegible] 117–126.

The determinations are carried out with 0·0025 *M* EDTA using a special cell in a spectrophotometer, on extracts from chromatographic strips. Results from analyses on the 50 m scale of dolomite, strontianite, and barytocalcite agree well with those by classical methods. It is claimed that 1 mg of dolomite or 3 mg of strontianite or barytocalcite can be analysed to within $\pm$1% for up to 20% oxide and $\pm$2% for oxides present in greater amount. R. A. H.

Single (W. V.). *Colorimetric estimation of manganese.* Nature, 1957, **180**, 250–251.

The tetramethyldiaminodiphenylmethane method for the estimation of quantities of the order of 0·01–0·1 μg Mn is reviewed. D. McK.

Král (S.). [*Chemical analysis of manganese ores.* Hutn. Listy, 1958, **13**, 925–927.] Anal. Abstr., 1959, **6**, abstr. 2961.

Brief details are given of the methods used in analysing anganese ores for Mn, MnO_2, SiO_2, Fe_2O_3, TiO_2, CaO, gO, total S, S^{2-}, P_2O_5, Al_2O_3, NiO, CuO, SnO_2, Co_3O_4, bO, and ZnO. R. A. H.

OLUÉKTOV (N. S.), NIKONOVA (M. P.), LEÏDERMAN (Ts. A.), & LAUÉR (G. S.). [*Flame-photometric determination of strontium in ores.* Zhur. Anal. Khim., 1957, **12**, 699–703.] Anal. Abstr., 1958, **5**, abstr. 2906.

Using an air-acetylene flame the Sr line 460·7 mμ is easured. Methods are described for preventing Ca interrence by modifying the preliminary treatment of the ample. R. A. H.

RIMALDI (F. S.) & SCHNEPFE (M. M.). *Semi-micro determination of tantalum with selenous acid.* Anal. Chem., 1958, **30**, 2046–2049.

Details are given for the determination of Ta in tantaloniobate ores. Precipitation of Nb with selenous acid is voided by the addition of tartaric and oxalic acids. Small mounts of Nb and Ti co-precipitating with Ta are determined colorimetrically. R. A. H.

BOOTH (E.). *Determination of phosphorus in low-grade uranium ores.* AERE-AM **7**, 1959, 3.

The ore, after sintering at 450° with Na_2O_2, is dissolved in dilute nitric acid and P is determined absorptiometrically as the molybdovanadophosphate complex. The method is applicable for up to 0·5% P : for 100 p.p.m. the coefficient of variation is $\approx \pm 2\%$. R. A. H.

RINGBOM (A.), AHLERS (P. E.), & SIITONEN (S.). *The photometric determination of silicon as α-silicomolybdic acid.* Anal. Chim. Acta, 1959, **20**, 78–83, 3 figs.

Most photometric methods for the determination of Si are based on reactions leading to β-silicomolybdic acid, but this form is unstable and smaller or larger amounts of the stable α form are always present. A method given for the determination of Si in silicates is based on the yellow colour of α-silicomolybdic acid : the pH must be kept within the range 3·0–3·7, and the equilibrium state established by heating the solution. The error for silicate rocks is quoted as $\pm 0{\cdot}1\%$ SiO_2. R. A. H.

GREENFIELD (S.). *The spectrophotometric determination of silica in presence of fluorine and phosphorus.* Analyst, 1959, **84**, 380–385, 3 figs.

A method is described for determining Si in minerals containing P and F : it is particularly applicable to phosphate rocks. The method is based on the reaction of fluorosilicic acid with ammonium molybdate to form molybdosilicate, which is then reduced to molybdenum blue : the reduction of any molybdophosphate formed is prevented by careful control of acid concentration. R. A. H.

VOINOVITCH (I. A.). [*Determination of silica in silicates.* Chim. Anal., 1958, **40**, 332–339.] Anal. Abstr., 1959, **6**, abstr. 2079.

Studies have been made of the scope, precision, reproducibility, specificity, and rapidity of various methods for determining SiO_2 in silicates. Precipitation of K_2SiF_6 and titration of HF formed by hydrolysis is rapid and simple. R. A. H.

ESHELMAN (H. C.), DEAN (J. A.), MENIS (O.), & RAINS (T. C.). *Extraction and flame spectrophotometric determination of aluminium.* Anal. Chem., 1959, **31**, 183–187, 5 figs.

Al can be selectively extracted from an acetate-buffered solution, adjusted to pH 5·5 to 6·0, with a 0·1*M* solution of 2-thenoyltrifluoracetone in 4-methyl-2-pentanone. Emission is measured at 396·2 mμ. Details are given for the application of the method to minerals. R. A. H.

CIMERMAN (C.), ALON (A.), & MASHALL (J.). *Titrimetric determination of aluminium with ethylenediaminetetraacetic acid in the presence of iron, copper, titanium, manganese, calcium, magnesium and phosphate.* Talanta, 1958, **1**, 314–328. R. A. H.

KROUŽEK (E.) & POVONDRA (P.). [*Determination of small amounts of mercury in inorganic raw materials.* Chem. Listy, 1958, **52**, 1825–1827.] Anal. Abstr., 1959, **6**, abstr. 2063.

Hg in ores is separated by distillation as chloride. R. A. H.

FEDORCHUK (S. N.). [*Determination of small amounts of beryllium in rocks and minerals by a fluorescence method with pentahydroxyflavone (morin).* Trudy Inst. Min. Geokhim. Kristallokhim. Redk. Element., Akad. Nauk S.S.S.R., 1957, 178–181.] Anal. Abstr., 1959, **6**, abstr. 853.

After chemical isolation of Be and Al and the addition of morin the yellow-green fluorescence due to Be is measured with a UV spectrophotometer. Smaller concentrations of Be can be determined by this method than by that using quinalizarin : the technique has been applied to the analysis of granite, greisen, topaz, tourmaline, fluorite, etc. R. A. H.

HILL (U. T.). *Photometric determination of beryllium.* Anal. Chem., 1958, **30**, 521–524.

[M.A. **13**–323, 437, 571] R. A. H.

Cohen (Allen I.) & Gordon (Louis). *Photometric titration of small amounts of barium with (ethylenedinitrilo)tetra-acetic acid.* Anal. Chem., 1956, **28**, 1445–7.

0·05 to 12 mg of Ba can be determined, using Phthalein Purpur as indicator. R. A. H.

Stumpf (K. E.) & Gonsior (Th.). *Über die gegenseitige Beeinflussung der Emission von Natrium und Kalium bei ihrer flammenphotometrischen Bestimmung.* Proc. Colloquium Spectroscopicum Internationale VI, (1956): Spectrochim. Acta, 1957, Supplement to **11**, 35–43.

A survey of the reciprocal interference of Na and K during their flame photometric determination indicates that it is preferable to use flames of low temperature, e.g. propane- or town gas-compressed air flames as excitation sources. With a constant concentration ratio (1 : 1) of Na to K in the solution reciprocal interference increases with increasing absolute concentration of Na and K to a maximum at 5–10 mg/litre and then falls as the concentration is further increased. The addition of acid (10 cc conc. HNO_3 per litre) reduces the interference of the alkali metals on one another and the addition of Al (as nitrate) reduces interference from Ca. Interference by Fe is not eliminated in acid Al-bearing solutions and Na emission should be corrected for Fe interference. G. D. N.

Kobayashi (S.). [*Volumetric determination of chlorine in silicate rocks.* Journ. Chem. Soc. Japan, Pure Chem. Sect., 1958, **79**, 546–550.] Anal. Abstr., 1959, **6**, abstr. 1309.

Chlorine in silicate rocks is precipitated as AgCl ; this is dissolved in KCN solution, treated with $KMnO_4$ in H_2SO_4, and the Ag^+ titrated by the Volhard method. R. A. H.

Ermolaeva (E. V.) & Korobka (L. A.). [*Polarographic determination of the oxides of aluminium, iron and titanium in aluminosilicate materials.* Bull. Nauchno-Tekn. Inform. Vses. Nauch Inst. Ogneuporov, 1957, **2**, 84–89.] Anal. Abstr., 1958, **5**, abstr. 4025. R. A. H.

Umezaki (Yoshimi). [*Determination of zinc in iron ores in the presence of cobalt.* Japan Analyst, 1958, **7**, 37–42.] Anal. Abstr., 1958, **5**, abstr. 3636.

The ion-exchange separation of Zn from Fe and Co, using Dowex 1-*X*8, is followed by the polarographic determination of the Zn. R. A. H.

Schöber (G.) & Gutmann (V.). *Über die polarographische Bestimmung von Lithium, Rubidium und Cäsium.* Mikrochim. Acta, 1958, 319–320.

Li may be determined polarographically in 80% isopropyl alcohol solution with tetraethylammonium hydroxide. Rb and Cs together may be determined by using lithi hydroxide as the conducting salt in 80% isopropyl alco solution. Results are accurate to ±1% for Li and ±0·5% for Rb and Cs. R. A. H.

Černý (A.). [*Indirect polarographic and complexomet determination of very small amounts of arsenic in ir and ores.* Hutn. Listy, 1958, **13**, 715–716.] Anal. Abst 1959, **6**, abstr. 2607. R. A. H.

Doležal (J.) & Novák (J.). [*Rapid analytical methods metals and minerals. VII. Polarographic determinati of cerium in alloys and minerals.* Chem. Listy, 1958, 2060–2065.] Anal. Abstr., 1959, **6**, abstr. 3432.

A procedure for determining Ce in monazite is describe R. A. H.

Solntsev (N. I.) & Chudina (R. I.). [*Use of polarograp in the phase analysis of lead compounds in ores and the enrichment products.* Sb. Nauch. Trud. Gos. Nauch Issled. Inst. Tsvet. Met., 1958, 80–92.] Anal. Abst 1959, **6**, abstr. 1245.

A procedure is described for the polarographic determin tion of all forms of Pb. Details are given for the selecti solution and determination of Pb in anglesite ; cerussite crocoite and wulfenite ; pyromorphite and vanadinite mimetite ; galena ; and beaverite, beudandite and plumb jarosite. [M.A. **13**–576, **14**–11]. R. A. H.

Weiss (D.). [*Polarographic determination of lead in ore* Chem. Listy, 1958, **52**, 1814–1815.] Anal. Abstr., 195 **6**, abstr. 2087.

[M.A. **13**–576, **14**–11.] R. A. H.

Kumar (S.) & Sinka (B. C.). *Simultaneous estimation titanium and iron in silicates by polarographic metho* Bull. Central Glass Ceram. Res. Inst., Calcutta, 195 **5**, 18–24. R. A. H.

Tuzova (A. M.) & Nemodruk (A. M.). [*Determination small amounts of zirconium and hafnium in silica rocks.* Zhur. Anal. Khim., 1958, **13**, 674–676.] Ana Abstr., 1959, **6**, abstr. 3451.

A method for determining Zr and Hf in rocks in which th total of both elements is $0{\cdot}5\times10^{-4}$ to 1×10^{-4} % involve concentration by double precipitation followed by X-ra spectral analysis. R. A. H.

Tsȳvina (B. S.) & Vladimirova (V. M.). [*Determination indium in sphalerite concentrates by amperometri titration with Complexone (III).* Zavod. Lab., 1958, 2 278–280.] Anal. Abstr., 1958, **5**, abstr. 4028.

[M.A. **13**–438, 570] R. A. H.

Various: thorium, uranium

ETZEL (O. A.), WESSLING (B. W.), & DESESA (M. A.). *Ion exchange–spectrophotometric determination of thorium.* Anal. Chem., 1958, **30**, 1182–1185.

Th is selectively separated from interfering elements by ion exchange procedure of either anion or cation exchange pe. In the latter case Th is eluted selectively and deter-ned with thorin. Results are given for uranium ores with brium. [M.A. **13**–141, 437, 438] R. A. H.

ATTA (S. K.). *Spectrophotometric determination of thorium with 2-(4-carboxy-3-hydroxyphenylazo)-1, 8-dihydroxy-napthalene-3, 6-disulfonic acid.* Anal. Chem., 1958, **30**, 1653–1656.

The violet complex of Th with this reagent, measured at 0 mμ and pH 2·5, is used to determine Th in monazite and ack sand extracts, after the removal of Zr and PO_4. [M.A. –141, 437] R. A. H.

UNG (SHAO-CHUN) & WANG (ER-KANG). *Amperometric titration of thorium in monazite.* Acta Chim. Sinica, 1959, **25**, 33–37.

Th in monazite can be determined in 3 hours, with an ror of $< \pm 2\%$. R. A. H.

AMON (P. E.) & FEELY (H. W.). *Radiometric analysis of uranium content in ores.* U.S. Atomic Energy Comm., 1957, Rept. RME-**3153**, 57pp.

A method is described for the rapid determination of U in es with a U content of $> 0{\cdot}2\%$: the error appears to be 20%. The method is valid regardless of the equilibrium ate of the sample and measures the 0·093 MeV α-ray of $^{234}Th(UX_1)$, the first daughter of ^{238}U. R. A. H.

VANS (L. G.) & RAMPACEK (C.). *Radiometric determination of uranium in ores.* U.S. Bur. Mines, 1958, Rept. Invest. **5390**, 15pp.

Two methods are described which are not suitable for uantitative chemical analysis of U, but which are useful s a control for detecting samples not worth chemical nalysis. R. A. H.

DE LANGE (P. W.). *Radiometric analysis of leached uranium-thorium ore samples with the beta-gamma-gamma method.* Anal. Chem., 1959, **31**, 812–813.

A radiometric method is described for the quantitative nalysis of naturally leached uranium-thorium ore samples. esults are in good agreement with chemical analyses: inimum concentrations determined have been 0·1% in 8g samples. R. A. H.

SCIUTI (S.) & PROSPERI (D.). *Precise radiometric determinations of uranium and thorium contents in ores.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 568–574, 3 tables, 3 figs.

The theory and practice of the β-γ-γ method are described, whereby β and γ activities are measured, the latter at two different energy levels. The method gives correctly the contents of U, Th, and Ra in a sample, even when U and Th are present in comparable amounts. An α spectrometer for the qualitative and quantitative determination of the α emitters of the U and Th series is also described, with particular reference to the determination of ^{210}Po. [M.A. **14**–240] J. E. T. H.

ALBERTI (G.), BETTINALI (C.), SALVETTI (F.), & SANTOLI (S.). *Rapid method for uranium determination in rocks by radiometric measurements of Pa^{234} in equilibrium with extracted Th^{234}.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 565–567, 2 tables.

^{234}Th in equilibrium with ^{238}U is extracted with mesityl oxide and separated from Bi by treatment with a chloroform solution of dithizone. Beta-counting of its immediate decay product ^{234}Pa is used to determine the uranium. A supplementary procedure allows ^{232}Th to be determined from ^{212}Pb. J. E. T. H.

STEELE (T. W.) & TAVERNER (L.). *Review of the chemical methods for the determination of uranium in ores, residues and products arising during processing.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 510–526.

Techniques for separating uranium from interfering elements are discussed under the headings precipitation, electrolysis and volatilization, chromatography, ion exchange, and solvent extraction. Methods for determining uranium after separation are reviewed under the headings volumetric, colorimetric, gravimetric, photometric, fluorimetric, and polarographic. There are 190 references. [M.A. **14**–11] J. E. T. H.

ATHAVALE (V. T.), BANERJEE (S.), BELEKAR (G. K.), MAHADEVAN (N.), MAHAJAN (L. M.), NADKARNI (M. N.), SANKAR DAS (M.), SHARMA (H. D.), SUNDARAM (A. K.), SUNDARESAN (M.), THAKOOR (N. R.), TILLU (M. M.), VARDE (M. S.), & VENKATESWARLU (CH.). *New and improved methods of analysis of some nuclear raw materials.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 554–560, 11 tables.

The paper reviews chemical methods developed in the Atomic Energy Establishment, Trombay, for the analysis of U, Th, Be, Nb, and Ta in minerals, ores, and processing products. J. E. T. H.

Czakow (J.), Radwan (Z.), & Strzyzewska (B.). *Spectrographic determination of uranium in ores and residues from leaching by the powder sifting method in the A.C. arc.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **3**, 561–564, 6 figs.

The sample is sifted from a hollow perforated electrode arranged vertically above a plane-shaped rod electrode, both of copper. Mixed with graphite and a Mo internal standard, the powder takes 45 sec. to fall through the A.C. arc. Excitation takes place in an A–O_2 mixture to avoid interference by cyanogen bands. The range of the method is 10^{-3} to 10^{-1} % U and the coefficient of variation for single determinations is $\pm 4{\cdot}7\%$. J. E. T. H.

Elbeih (I. I. M.) & Abou-Elnaga (M. A.). *New method based on paper chromatography for the determination of uranium in uranium minerals.* Chemist Analyst, 1958, **47**, 92–93.

A chromatographic procedure is followed by the treatment with acetic acid of the U spots, cut from the paper, and titration with EDTA. Results from 20 to 100 μg of U showed errors of from $-1{\cdot}5$ to $+1{\cdot}2$ μg. [M.A. **14**–167, 240] R. A. H.

Upor (E.), Fekete (L.), & Nagy (G.). [*Determination of the uranium content of ores by separation with carbonate.* Magyar Kem. Lapja, 1958, **13**, 305.] Anal. Abstr., 1959, **6**, abstr. 2136.

Complete solution of uranium precipitated with ammonia with excess carbonate can be achieved by adding $Th(OH)_4$, which prevents the adsorption of uranium on to the $Al(OH)_3$ and $Fe(OH)_3$ present. R. A. H.

Subbarayudu (G. V.) & Raghava Rao (Bh. S. V.). *Rapid polarographic procedure for the estimation of uranium in its ores.* Journ. Sci. Industr. Res., India, 1958, **17**, **B**, 363–365.

It is suggested that for non-phosphatic ores ammonium lactate may be used in the polarographic estimation of U. Results are given for U determined by this method in samarskite, allanite, and monazite. [M.A. **13**–258] R. A. H.

Brooke (C.), Picciotto (E.), & Poulaert (G.). *Mé directe de l'uranium et du thorium par spectrom gamma.* Bull. Soc. belge Géol., 1958, **67**, 315–328, 6

Explanation of the principles of gamma spectrom with a description of the spectrometer in use and of gamma spectra of U and Th. The results obtained by method applied to artificial mixtures of pitchblende thorite are described ; they differ by some units % from values found by weight measurements. The factors affec the error and the conditions under which the method ca used are examined. F. Sc.

Koppikar (K. S.), Korgaonkar (V. G.), & Mur (T. K. S.). *Spectrophotometric determination of uran Application of the method to the analysis of leach solut and monazite.* Anal. Chim. Acta, 1959, **20**, 355– 1 fig.

Uranyl thiocyanate complex is extracted from a slig acid solution, using tributyl phosphate—carbon te chloride as solvent. [M.A. **14**–84] R. A. H

Cuttitta (F.) & Daniels (G. J.). *Determination of uran in zircon.* Anal. Chim. Acta, 1959, **20**, 430–434, 2 f

A routine fluorimetric procedure is described wh employs the direct extraction of uranyl nitrate with e acetate using phosphate as a retainer for zirconium. S microgram amounts of U are separated in the presenc 100,000 times the amount of Zr. Results have a stand deviation of 2·5%. R. A. H

Jain (P. C.) & Rao (G. S.). *Resorcinol as an analyt reagent for the spectrophotometric determination uranium.* Anal. Chim. Acta, 1959, **20**, 171–174, 4 f R. A. H

Fisher (Sallie) & Kunn (Robert). *Use of ion excha resins for determination of uranium in ores and soluti* Anal. Chem., 1957, **29**, 400–402.

The separation of U from interfering ions can be effec by adsorption of the U^{IV} sulphate complex on a quatern ammonium anion exchange resin, followed by elution w 1*M* perchloric acid. Results are given for carnotite, pit blende, and other ores : an accuracy of $\pm 2\%$ may expected. R. A. H

CLAY MINERALS

[Vikulova (M.F.) & others] Викулова (М. Ф.) и коллектив. Методическое руководство по петрографу-минералогическому изучению глин. [*A method manual on the petrographic-mineralogical study of clays.*] Госгеолтехиздат [Gosgeoltekhizdat], Moscow, 1957, 381, 76 figs., 31 pls. Price 22r. 05k.

This manual is written by eight authors under the leadership of M. F. Vikulova. It contains fourteen chapters, contents of which are : (1) General characteristics of cl including a description of clay minerals, their properties genesis ; (2) Laboratory methods of studying clays ; Petrographical analysis ; (4) Granulometric analysis ; Mineralogical analysis ; (6) Electromicroscopic analy (7) Structural analysis (X-rays and electron-diffraction)

ctrophotometric analysis ; (9) Thermal analysis ; (10) mical analysis ; (11) Studies of the exchange capacity clays ; (12) Dialysis and electrodialysis ; (13) Infrared-ctroscopic analysis ; (14) Examples of the study of clays a combination of methods, and the modern state of the rographical-mineralogical methods of study. This is owed by tables, plates, and subject index. Each chapter written by a specialist and is illustrated by plates and grams and provided with a bibliography. It is written such a way that a non-specialist in any branch would get introduction to the subject. S. I. T.

LAUGHLIN (R. J. W.). *Effects of grinding on dickite.* Clay Min. Bull., 1955, **2**, 309–317.

Dickite was ground dry for periods of up to 140 hours d wet for 60 hours. The principal changes in the d.t.a. rve were the relatively rapid disappearance of the main dothermic peak and the increase in size of the exothermic ak with time of grinding. Wet grinding was not so structive as dry. Dehydration curves showed that the rease in amount and in temperature range of water loss lminated at 15 hours dry grinding. X-ray results demons-ated distortion and break-down of the lattice in dry inding but splitting along cleavage planes in wet grinding. ne significance of these results is discussed. R. C. M.

ERRIER (E. R.) & EVANS (D. D.). *The electric balance technique for measuring the mass and charge of clay particles.* Proc. Soil Sci. Soc. America, 1959, **23**, 97–100.

The Millikan oil drop apparatus has been used to easure at the same time both the mass and the charge of individual, air-dry clay particle. The mass has been easured by two methods to allow evaluation of the error volved in using Stokes's law when the particles are of regular shape. C. D. J.

ERRIN (R. M. S.). *The preparation of oriented aggregates for Brindley-Robinson type X-ray cameras.* Clay Min. Bull., 1955, **2**, 307–308.

A detailed description of a perspex centrifuge tube with tachable base in which a recess is machined to hold the ass specimen slips used in Brindley-Robinson type X-ray meras. Advantages of the use of this type of camera are oted. R. C. M.

OBERTSON (R. H. S.). *Preparatory techniques.* Clay Min. Bull., 1956, **3**, 2–3.

Summary of an introductory lecture to a discussion on this bject. Perfection of sampling technique, effect of disper-on on natural structures, chemical methods of purification, nd methods of pretreatment for specific determinations re all commented upon. R. C. M.

MACKENZIE (R. C.). *Methods for separation of soil clays in use at the Macaulay Institute for Soil Research.* Clay Min. Bull., 1956, **3**, 4–6.

Methods of separating clays for examination by X-ray and differential thermal techniques are described. They require no specialized apparatus, and involve dispersion, sedimentation, coagulation, and peroxidation. A modified procedure for organic soils is also given. B. D. M.

MACKENZIE (R. C.) & FARQUHARSON (K. R.). *A method for concentration of dilute clay suspensions without coagulation.* Clay Min. Bull., 1956, **3**, 7.

A vacuum distillation technique is described for the rapid concentration of dilute clay suspensions ; at 30–35°C there is no tendency for the clay to coagulate. B. D. M.

HATHAWAY (J. C.). *Procedure for clay mineral analyses used in the Sedimentary Petrology Laboratory of the U.S. Geological Survey.* Clay Min. Bull., 1956, **3**, 8–13.

After crushing, dispersion, and shaking, clay and silt fractions are separated by sedimentation and centrifuge procedures. The bulk of the clay is recovered from the suspension on a filter candle, dried, and bottled. The remaining original suspension, converted to Ca-clay by passing through an ion-exchange column, is used for the preparation of oriented aggregates. At least six X-ray diffractometer tracings are obtained for each sample after different treatments ; other complementary techniques are employed occasionally. R. C. M.

GARD (J. A.). *Specimen preparation for electron microscopy.* Clay Min. Bull., 1956, **3**, 14–18.

The factors affecting choice of techniques are noted, and the preparation of supporting films, dispersion procedures for clays (dry and in suspension), surface replica techniques, reflection techniques, shadow-casting, and stereo-electron-microscopy are all briefly described. R. C. M.

BROWN (G.), DIBLEY (G. C.), & FARROW (R.). *An extrusion method for bonded powder specimens.* Clay Min. Bull., 1956, **3**, 19–21.

This apparatus for preparing cylindrical specimens for X-ray powder examination consists essentially of a No. 27 hypodermic needle and boss held in a special clamp. The clay, bonded with gum arabic, is extruded by a screw pushing a piston fitting into the boss, the system being easily demountable. There is some tendency to preferred orientation. Advantages of the technique are listed. R. C. M.

NEUMANN (B. S.). *The preparation of sealed powder specimens for X-ray analysis.* Clay Min. Bull., 1956, **3**, 22–25.

A simple technique for sealing Lindemann glass tubes containing clay samples under controlled-atmosphere conditions is described. R. C. M.

Williamson (W. O.). *The use of peels in microscopical study of clay aggregates.* Clay Min. Bull., 1956, **3**, 26–30.

A technique for depositing a pyroxylin film on a freshly-cut clay surface and for stripping and mounting this film on a microscope slide is described. Such peels facilitate study of the manner of deposition or deformation of the clay particles. In an illite-kaolinite clay examined by this method, aggregates appear deceptively monocrystalline owing to parallelism of the plates. The effect on orientation of various mechanical forces and the orientation of non-platy particles with respect to the clay mineral particles were also studied. R. C. M.

Cartwright (J.). *The preparation and assessment of size-graded mineral particles.* Clay Min. Bull., 1956, **3**, 31–35.

Ground quartz and other silica minerals were divided into closely size-graded fractions, by sedimentation for particles $> 2\,\mu$ and by a centrifuge method for particles $< 2\,\mu$. The diameter calculated from Stokes's equation is related to the mean projected diameter (as observed under the microscope or the electron microscope) in the ratio 1 : 1·54 for sizes up to at least 50 μ. Using the statistical 'volume-surface' diameter and suitable shape factors the surface area may be calculated with a good degree of accuracy. R. C. M.

Mitchell (W. A.). *A double focusing X-ray powder camera.* Clay Min. Bull., 1956, **3**, 36–39.

Use of a semi-cylindrical specimen with a semicircular X-ray beam enables focusing of a selected line to a spot at an appropriate specimen-film distance. Reflections at higher angles than that selected appear as arcs above the central spot and those at lower angles as arcs below the spot. Experimental details are given and the results demonstrated by some photographs. R. C. M.

Cano-Ruiz (J.) & MacEwan (D. M. C.). *The flat-layer method applied to clays.* Clay Min. Bull., 1956, **3**, 40–43.

The use of a flat-layer specimen for focusing reflections is described, and modifications necessary to enable a Unicam single-crystal goniometer to be used with this technique are detailed. In certain circumstances the method can be very convenient—both from the ease of specimen preparation and from the short exposure time necessary. R. C. M.

Brown (G.) & Farrow (R.). *Introduction of glycerol into flake aggregates by vapour pressure.* Clay Min. Bull., 1956, **3**, 44–45.

Oriented-aggregate specimens attached to Lindem glass fibres are suspended for two hours above a dis glycerol previously heated to 100–105°C. Preferred orie tion in the aggregates is not then disturbed by glyc treatment. R. C. M

Brown (G.) & Dibley (G. C.). *Moderately low a measurements with a 9·0 cm powder camera.* Clay M Bull., 1956, **3**, 46–47.

A beam catcher movable between the specimen and film is described and details given of the construction o accurate positioning arrangement. Spacings of up to or more may be measured with Co $K\alpha$ radiation in a 9 camera. R. C. M

Jarvis (N. L.). [*A method for the quantitative determina of clay mineral mixtures by X-ray diffraction and application to four soils of southeast Kansas.* The Kansas State Coll., 1958.] Brit. Ceram. Abstr., 1 abstr. 1165.

The determination of intensity constants for the X-ray reflections of illitic, kaolinitic, and montmorillon types of clay was made with reference to the 1·48Å M reflection. The percentage composition of known synth mixtures of 2 and 3 components was then determined w an average deviation of 1·87% from the actual compositi For clay constituents amounting to less than 10%, h ever, larger deviations resulted; small amounts of il were particularly difficult to detect. R. A. H

Menczel (G.). [*Quantitative X-ray diffraction analysis boehmite-hydrargillite mixtures.* Magyar Kém. Fo 1958, **64**, 143–148.] Anal. Abstr., 1959, **6**, abstr. 573

The 020 and 200 reflections for boehmite and hydrargil respectively were selected, but as these lines were diffic to separate the integrated intensity of the two lines v determined. The main sources of error and their eliminati are discussed: the maximum error for mixtures with 2 to 80% boehmite was 3%. R. A. H

Bidet (J. P.). [*A contribution to the study of the effect of h on kaolinites.* Bull. Soc. Franç. Ceram., 1958, **39**, 4 Brit. Ceram. Abstr., 1959, abstr. 1119.

Tests on mixtures of amorphous SiO_2 and Al_2O_3 app to confirm the theory that the exothermic peak at abo 970°C on the d.t.a. curves of kaolinites is due to the form tion of very small mullite crystals. R. A. H

Wada (Koji). *Oriented penetration of ionic compou between the silicate layers of halloysite.* Amer. Min., 19 **44**, 153–165, 1 fig.

One dimensional reversible swelling occurs between

cate layers of halloysite with oriented penetration of ic compounds such as K^+, NH_4^+, Rb^+ and Cs^+. These ve ionic diameters of 2·7Å or more. Smaller cations such Na⁺, Li^+, Mg^{2+}, Ca^{2+} and Ba^{2+} did not produce swelling. ntmorillonite does not show this type of swelling. It is stulated that the cations and anion replace the interlayer ter between the silicate layers of halloysite. A. C. H.

MERSON (W. W.). *Organo-clay complexes.* Nature, 1957, **180**, 48–49.

Polyvinyl alcohol and simple alcohols form complexes ith montmorillonite in which carbon chains are ⊥ (001). ydrogen bonding of two alcoholic OH groups to a clay xygen atom to satisfy tetrahedral coordination, with van er Waals contact at the other clay oxygen surface, deter- ines the orientation of interlayer molecules. Observed and lculated spacings for various montmorillonite and halloy- te complexes are in good agreement. D. McK.

ANDERSTAPPEN (R.) & CORNIL (J.). *Contribution à l'étude des minéraux argileux du type 'Mixed Layers'.* Bull. Soc. belge Géol., 1958, **67**, 91–103, 5 figs.

A study of the clay fraction of a sandstone from the R. Nionzi-Lubuzi, Mayumbe, lower Belgian Congo, by the sual methods—complete chemical analysis, base-exchange apacity, d.t.a., thermo-gravimetric analysis, and X-rays. fter discussion of the results, the conclusion is drawn that he material is 'mixed-layer' with regular interleaving of nica, hydromica, and montmorillonite in equal proportions. F. Sch.

HEGEMANN (FR.), GIESEN (K.), & KOSTYRA (H.). *Über die spektrochemische Bestimmung der Neben- und Spurenelemente in Kohlen.* Ber. dtsch. keram. Ges., 1959, **36**, 145–149.

Two methods—the condensed spark and the D.C. arc—were used with unashed coal samples, Ni being used as an external standard. Errors lie between ±2·5% and ±8·5% for different elements, and the coal type influences the calibration curve. R. C. M.

STUBIČAN (V.) & GÜNTHARD (HS. H.). *Infra-red spectra of high-temperature phases of kaolinite and halloysite.* Nature, 1957, **179**, 542.

Results show that the high-temperature phases of kaolinite and halloysite differ, especially in the range 650–900°C. The infra-red spectra of the products formed by heating either mineral to between 1200°–1350° resemble those of mullite more closely than those of sillimanite. C. H. K.

KULBICKI (G.) & GRIM (R. E.). *A new method for thermal dehydration studies of clay minerals.* Min. Mag., 1959, **32**, 53–62, 6 figs.

The water vapour released upon heating the specimen is driven through a water absorber, and the intensity of the exothermic reaction produced by water absorption is recorded against the temperature of the specimen. Results for various clay minerals (halloysite with gibbsite, kaolinite, dickite, kaolinite with illite, illite, nontronite, hectorite, montmorillonite, sepiolite, and palygorskite) are presented and compared with d.t.a. results. The method is of particular use in resolving the ambiguity of d.t.a. endothermic peaks which may indicate structural change with or without loss of water. J. Z.

SERWZTZKY (G.). [*Determination of the mineral composition of clays.* Sprechsaal, 1958, **91**, 396.] Brit. Ceram. Abstr., 1959, abstr. 586.

A general review of X-ray, d.t.a., and electron microscope methods leads to the conclusion that only by applying all of them can a fairly accurate determination be made. A. G. C.

SCHOLLENBERGER (C. J.) & WHITTAKER (C. W.). *Improved determination of carbonates in soils.* Soil Science, 1958, **85**, 10–13, 1 fig.

The estimation of CO_2 in soils by treatment with HCl, in the presence of stannous chloride to minimize the formation of CO_2 by degradation of organic matter, is improved by thermostatic control, by constant shaking of both the reaction and absorption flasks, and by recirculation of the air+CO_2 until complete absorption is effected in barium hydroxide solution by simple bubbling. R. A. H.

CAILLÈRE (S.) & HÉNIN (S.). *A propos d'un échantillon d'argile trouvé à la Bourboule (Puy-de-Dôme).* Bull. Soc. franç. Min. Crist., 1959, **82**, 217–218.

A clay previously identified [M.A. **8**–296] as a mixture of kaolinite and montmorillonite is now shown to belong to the group of swollen dioctahedral clays, or more precisely beidellite. Its measured c.e.c. is 117 me/100 g. This type owes its relatively large c.e.c. mainly to a substitution of Al for Si in tetrahedral sites. R. A. H.

CAILLÈRE (SIMONNE), HÉNIN (STÉPHANE), & BIROT (PIETTE). *Sur la formation transitoire de montmorillonite dans certaines altérations latéritiques.* C.R. Acad. Sci. Paris, 1957, **244**, 788–791.

Experiments undertaken to bring on alteration in acid and alkaline eruptive rocks have shown the presence of montmorillonite. This mineral appears to be linked to the first phase of alteration and should be present in the products of natural decomposition of rocks. The authors have in fact recognized montmorillonite in the crusts of lateritic alteration of a dolerite, an amphibolite, and two gabbros. It

appears, therefore, that even in lateritic alteration the first clay minerals formed can be montmorillonites. E. J.

Swindale (L. D.). *A one-dimensional Fourier investigation of a soil montmorillonite.* New Zealand Journ. Geol. Geophys., 1959, **2**, 342–349, 2 figs.

A Fourier investigation of a glycerol-solvated soil montmorillonite, derived from olivine basalt, has been carried out. This showed that the calculated formula, $(K_{0\cdot16}Na_{0\cdot02}H_{1\cdot00})(Si_{6\cdot36}Al_{1\cdot64})(Al_{0\cdot82}Fe^{3+}_{2\cdot30}Fe^{2+}_{0\cdot08}Mg_{0\cdot48}Ti_{0\cdot08})O_{18\cdot36}(OH)_{5\cdot64}$ was essentially the correct one for the dehydrated mineral. In an electron density map of the mineral partial resolution of the O–H and C–H planes of ions of the glycerol molecule was achieved. It was not possible to resolve the densities of the octahedral cations from those of the adjacent plane of oxygen-hydroxyl ions nor those of the tetrahedral cati from those of the adjacent plane of oxygen ions. [Auth abstract] W. A. W

Mehra (O. P.) & Jackson (M. L.). *Constancy of the sum mica unit cell potassium surface and interlayer sorpt surface in vermiculite-illite clays.* Proc. Soil Sci. S America, 1959, **23**, 101–105.

The planar specific surface of expanding layer silic clays was determined by the glycerol sorbed at 110°C in presence of free glycerol and with the dishes par uncovered. The planar surface, computed as the sum sorption surface and the mica inter-planar surface, v found to be constant for vermiculite-illite clays with avera value 773 m^2/g. C. D. J

CRYSTAL STRUCTURE OF MINERALS

Crowder (M. M.), Morley (K. A.), & Taylor (C. A.). *Direct structure determination by optical-transform methods.* Nature, 1957, **180**, 431–432.

An example is given of the application of the methods in the absence of any chemical information other than the unit-cell contents. D. McK.

Srivastava (S. N.). *Elimination of the film shrinkage error in Weissenberg photographs.* Acta Cryst., 1959, **12**, 412.

The method requires no knife edges or standard substance ; it makes use of the angle of inclination of white radiation streaks and yields Bragg angles corrected for film shrinkage. [M.A. **13**–433, **14**–10] J. Z.

Hawes (L. L.). *The determination of lattice constants using low angle diffraction lines.* Acta Cryst., 1959, **12**, 443–445, 3 figs.

Accurate lattice constants and interplanar spacings are derived from low angle reflections recorded on a cylindrical camera whose axis is parallel to the incident beam. Details of the camera, and a sample lattice determination, are given. J. Z.

Ubbelohde (A. R.). *Hole and claw defects in graphite.* Nature, 1957, **180**, 380.

Defect sites completely enclosed by the macro-aromatic network give rise to 'aromatic holes' ; at re-entrants in the margin of the network 'claw defects' can arise. Carbon atoms at the edges of internal holes or claws can form bonds with foreign atoms, giving rise to out-of-plane buckling ; far-reaching out-of-plane cooperative defects affecting chemical reactivity may result. Alternatively the planar configuration may be conserved by one C atom at a defect site combining with a foreign atom, while another C atom is left vacant with an unpaired spin ; unpaired electron sp have been observed in partly ordered graphite. D. McK.

Wood (Elizabeth A.). *Microframeworks.* Amer. Mi 1959, **44**, 416–419. [Summary of the retiring presiden talk, Amer. Cryst. Assoc., June 26, 1958.]

Microframeworks are those regular, repetitive features crystalline materials whose repeat distances are larger th interatomic ones but are features not visible to the unaid eye. Six types are briefly discussed : (1) micromolds, microsandwiches, (3) microgrids, (4) microcages, (5) micr sieves, and (6) microjigs. Because of these features t physical and chemical properties of a substance under t conditions which exist in some microframeworks may unusual and of technological interest. B. H. B.

Jenson (A. T.) & Rowles (S. L.). *Lattice constants a magnesium contents of some naturally occurring wh lockites.* Nature, 1957, **179**, 912–913.

Examination of a series of synthetic magnesian whi lockites shows that the cell dimensions are roughly pr portional to the magnesium content up to its solubilit limit. The variation in cell dimensions of the natural whi lockites may be due to iron substitution. C. H. K.

Smith (James P.) & Brown (Walter E.). *X-Ray studies aluminum and iron phosphates containing potassiu or ammonium.* Amer. Min., 1959, **44**, 138–142.

From this study a new formula $H_6K_3Al_5(PO_4)_8.18\ H_2$ is proposed for taranakite. Haseman [Proc. Soil Sci. So Amer., 1950, **15**, 76] reported $H_4K_2Al_3(PO_4)_5.H_2O$. In th layer structure postulated for taranakite the aluminiu phosphate sheets are separated by water molecules. A. C. H.

TES (THOMAS F.). *Morphology and crystal chemistry of 1 : 1 layer lattice silicates.* Amer. Min., 1959, **44**, 78–114, 5 figs.

The 1 : 1 layer structure gives kaolin, serpentine, and other ucturally associated minerals morphological and struc- ral characteristics which are sensitive to a slight change in emical composition. 71 chemical analyses are cited rysotile, 8 ; platy serpentine, 15 ; chlorite, 7 ; dickite, 7 ; olinite, 12 ; halloysite, 18 ; others, 4). Of these 64 were aluated and compared to demonstrate the interrelation- ips of the chemistry, structure and morphology. Evalua- on was based on (1) a morphological index—a measure of nount of misfit of tetrahedral and octahedral sheets ; (2) rnary diagrams representing proportions of SiO_2, Al_2O_3 (or "O) and H_2O ; (3) assignment of the number of cations to e tetrahedral sheet in relation to a standard number in the tahedral sheet ; (4) amount of deficient or excess H and O corded as H_2O+ in the analysis as related to requirements r the correct number of O and OH ions in the structural rmula. Variation in the amount of misfit or octahedral nd tetrahedral sheets shows the expected distinction tween the kaolins, serpentines, and other 1:1 minerals nd a small distinct difference between chrysotile and platy rpentine. Results of formula calculations show that ubular and lath-shaped varieties of kaolins and serpentines ave significant excess of H and O in the H_2O+ value of nalysis as compared to that 'required' by cations.

A. C. H.

HORT (M. A.) & STEWARD (E. G.). *Measurement of disorder in zinc and cadmium sulphides.* Amer. Min., 1959, **44**, 189–193, 1 fig.

Measurement of disorder is a modification of that de- ribed by Smith. [M.A. **13**–488 ; A.M. **40**–658]

A. C. H.

ROWN (G.) & STEPHEN (I.). *A structural study of iddingsite from New South Wales, Australia.* Amer. Min., 1959, **44**, 251–260, 2 figs., 2 tables.

Iddingsite in olivine basalt from New South Wales, con- ists of orientated microcrystals of goethite and a triocta- edral layer lattice silicate. The original lattice of close- acked oxygens of the parent olivine has not been greatly isturbed, the alteration has been one of cation removal of Ig and Si and addition of Fe and H. From plots of the omposite reciprocal lattice about 80% of the goethite is ligned parallel to the original olivine with 10% in each of wo symmetrical positions. The *c* axis of the vermiculite- ke layer silicate is parallel to the [100] plane of the parent livine, the *a* axis is parallel to [010], [$0\bar{1}3$], and [$0\bar{1}\bar{3}$] planes f the parent olivine.

B. H. B.

PUNDSACK (F. L.). *The properties of asbestos. I. The colloidal and surface chemistry of chrysotile.* Journ. Phys. Chem., 1955, **59**, 892–895.

Chrysotile asbestos fibres were subjected to chemical analysis, d.t.a., and thermobalance study. Surface area measurements by nitrogen adsorption show that interfibril spaces are not readily accessible to the gas. Turbidity and electrokinetic measurements in suspensions of varying pH show that the behaviour of chrysotile is similar to that of magnesium hydroxide. Analysis of chrysotile from Danville area, Quebec, by T. Sopoci and R. Wiley gave SiO_2 41·97, Al_2O_3 0·10 approx., Fe_2O_3 0·38, FeO 1·57, MgO 42·50, K_2O 0·08, (Cr_2O_3, TiO_2, CaO, NiO, Mn_2O_3) 0·10 determined spectrographically.

J. Z.

PUNDSACK (F. L.). *The properties of asbestos. II. The density and structure of chrysotile.* Journ. Phys. Chem., 1956, **60**, 361–364.

Blocks of chrysotile fibre [analysis in previous abstract] were sealed with paraffin wax and their densities measured in a pycnometer. Results of chrysotile density, from both sealed and unsealed specimens, are too high to be compatible with the suggested 'hollow tube' structure [M.A. **12**–337, **13**–15, 285, and following abstract.] The only appreciable void space in the fibre bundles is that of sorbed water. Fundamental fibres may exist with ribbon-like structures, curved about the fibre axis.

J. Z.

WHITTAKER (E. J. W.). *The structure of chrysotile. V. Diffuse reflections and fibre textures.* Acta Cryst., 1957, **10**, 149–156.

Assuming the structure of chrysotile fibrils to be one of concentric cylinders [M.A. **12**–337, **13**–15, 285] the intensity distributions in a number of diffuse X-ray reflections are calculated and the effects on them of fibril size distribution are derived. These calculations are used to deduce from the measured intensity profiles, probable fibril diameters and their distribution, the radius of the strain-free layer, and the *b* parameter of the cylindrical lattice. The existence of spiral, helical, and incomplete cylindrical layers is discussed in relation to the X-ray data and measurements of density by Pundsack [preceding abstract].

J. Z.

BRINDLEY (G. W.), COMER (J. J.), UYEDA (R.), & ZUSSMAN (J.). *Electron-optical observations with crystals of antigorite.* Acta Cryst., 1958, **11**, 99–102, 3 figs.

Electron-optical fringes were obtained from an antigorite (Yu-Yen stone, from Manchuria) which agree in spacing and direction with the superlattice parameter $a = 100 \pm 10$Å determined by electron diffraction [M.A. **13**–543].

R. A. H.

Chapman (J. A.) & Zussman (J.). *Further electron optical observations on crystals of antigorite.* Acta Cryst., 1959, **12**, 550–552, 2 figs., 2 pls.

Fringe systems with appropriate spacings have been observed in electron micrographs of crystals of varieties of antigorite which have cell parameters $a \approx 40$Å and $a \approx 19$Å. Furthermore, contiguous regions of a single crystal of a fibrous antigorite show spacings of 19·1 and 16·8Å respectively. Possible relationships between the variable spacings and crystal structure are discussed. [M.A. **13**–543 ; and preceding abstract] R. A. H.

Tuddenham (W. M.) & Lyon (R. J. P.). *Relation of infrared spectra and chemical analysis for some chlorites and related minerals.* Anal. Chem., 1959, **31**, 377–380, 4 figs.

The infrared analysis of 21 chlorites and related minerals which had been characterized previously by optical, X-ray, and d.t.a. methods has demonstrated the possibility of the determination of both the degree of substitution of Al for Si and total Fe content of these minerals by infrared data alone. The structural type also can be deduced readily from the infrared curve. There is a possibility of a structural modification as the replacement of Si by Al increases beyond 30%. The modification of the infrared curves by excessive grinding may be avoided by grinding under alcohol. [M.M. **30**–277, **31**–829 ; M.A. **13**–429] R. A. H.

Barrer (R. M.), Bultitude (F. W.), & Kerr (I. S.). *Some properties of, and a structural scheme for, the harmotome zeolites.* Journ. Chem. Soc., 1959, 1521–1528, 5 figs., 1 pl.

A report is given of the dehydration, sorption, and X-ray diffraction patterns of several closely related synthetic aluminosilicates belonging to the harmotome-phillipsite group of zeolites. A structure is proposed for a cubic variety of the synthetic phases and the relations between this structure and orthorhombic or monoclinic unit cells of harmotome and phillipsite are indicated. The aluminosilicate framework of the cubic structure has cubic structural units at each corner and at the centre of each unit cell ; these cubic units are formed by union by oxygen bridges of two rings of four SiO_4 or AlO_4 tetrahedra giving a cluster of eight such tetrahedra. Each cubic unit is then joined by single oxygen bridges to eight similar units, producing a system of intersecting channels with eight-membered rings as 'windows'. R. A. H.

Tolliday (Joan). *Crystal structure of β-wollastonite.* Nature, 1958, **182**, 1012–1013, 1 fig.

Three-dimensional single crystal X-ray work on parawollastonite from Crestmore, California, confirms the type of infinite-chain structure recently proposed [M.A. **13**–420, 421]. The repeating unit of three silicon tetrahedra the chains, which are parallel to *b*, consists of a pair tetrahedra joined apex to apex alternating with a sin tetrahedron with one edge parallel to the chain directi The calcium coordination is irregular, though all Ca ato are co-planar with four near O atoms and have distor octahedral coordination. The Crestmore parawollaston has *a* 15·417, *b* 7·321, *c* 7·066Å, β 95°24′, space gro $P2_1/a$, *Z* 12, sp. gr. 2·922. [M.A. **6**–260, 332] R. A. H

Takéuchi (Y.) & Donnay (Gabrielle). *The crystal struct of hexagonal $CaAl_2Si_2O_8$.* Acta Cryst., 1959, **12**, 4 470, 8 figs.

Hexagonal $CaAl_2Si_2O_8$ has *a* 5·10, *c* 14·72Å, *Z*=2 [M **12**–96], and most probable space group $P6_3/mcm$. T structure consists of double sheets (composition $Al_2Si_2O_8$) linked oxygen tetrahedra ($Al_2Si_2O_4$) which are similar those found in hexagonal $BaAl_2Si_2O_8$. Ca ions lie betwe the double sheets, and stacking disorder is such that th are in sixfold coordination by oxygens at the corners either a trigonal prism or a trigonal antiprism which almost an octahedron. The $Al_2Si_2O_8$ sheets are deform and have trigonal symmetry, and the deviation from t ideal hexagonal symmetry of β-hexagonal $BaAl_2Si_2O_8$ much more pronounced in $CaAl_2Si_2O_8$ than in α-hexagon $BaAl_2Si_2O_8$. [M.A. **11**–308, **12**–79] J. Z.

Flachsbart (I.) & Niebsch (H.). *Gitterkonstanten u Raumgruppe von Spencerit.* Naturw., 1958, **45**, 437.

Spencerite, $Zn_3(PO_4)_2.Zn(OH)_2.3H_2O$, is monoclinic with 10·54±0·07, *b* 5·33±0·04, *c* 11·3±0·1Å ; *a* : *b* : *c*=1·878 : 2·120, β 117°±0·5°. From the density of 3·14 g/cm³ it concluded that *Z*=2. The space group is $P2/c$–C_2^5h. T structure is being determined. [M.A. **1**–5, 6, 341] A. G. C.

Rao (G. Sivasankara). *Space group symmetry of K_2Cr_2C* Journ. Indian Inst. Sci., 1959, **41**(3), 47–51.

α-Potassium dichromate is triclinic with *a* 7·34, *b* 7·4 *c* 13·39Å, α 96°20′, β 97°56′, γ 90°30′. Measured values *0kl*, *h0l* and *hk*0 intensities were tested statistically by t methods of Wilson and of Howells, Philips, and Roge These showed the space group to be $P\bar{1}$ rather than $P1$, agreement with the morphology and with the absence piezo- and pyro-electric effects, but contrary to conclusio previously drawn from experiments on crystal growth a etch figures. The complete crystal structure is being dete mined, when the controversy should be finally resolved. R. J. D.

Smith (J. V.). *The crystal structure of proto-enstati $MgSiO_3$.* Acta Cryst., 1959, **12**, 515–519, 3 figs.

Proto-enstatite, prepared from an $MgSiO_3$ glass at 1080°C nd 500 bars water pressure, is orthorhombic with a 9·25, 8·74, c 5·32Å, $Z=8$, and pseudo-space group *Pbcn*. The ructure was determined from powder data only and is milar to that predicted by Atlas [M.A. **12**–80]. The pyr-kene SiO_3 chain is fully extended; one of the Mg atoms is in gular octahedral coordination with average Mg–O stance 2·1Å, while the other Mg has four oxygen neigh-ours at 2·1Å and two at 2·5Å. It is suggested that this regular coordination may be the reason for the instability proto-enstatite at low temperature. [M.A. **11**–470]

J. Z.

TUBIČAN (V.). *Residual hydroxyl groups in the metakaolin range.* Min. Mag., 1959, **32**, 38–52, 8 figs.

Infra-red absorption spectra have been obtained from pecimens of well-crystallized kaolinite, poorly crystalline aolinite, and halloysite, which have been previously heated o 600°–850°C. Characteristic absorption bands show that tructurally disordered specimens retain hydroxyl groups t higher temperatures. It is suggested that ordered kaoli-ite tends to retain its atomic structure and form meta-aolin [M.M. **30**–182], whereas disordered structures earrange to yield γ-alumina [but see Brindley & Nakahira, 958, Nature, **181**, 1333] for the formation of which water s probably essential. The nature of products from heating t higher temperatures is discussed. [M.A. **11**–157, 449, 4–17]

J. Z.

MCCULLOUGH (J. D.) & TRUEBLOOD (K. N.). *The crystal structure of baddeleyite (monoclinic ZrO_2).* Acta Cryst., 1959, **12**, 507–511, 3 figs.

Baddeleyite is monoclinic with a 5·169, b 5·232, c 5·341Å all ±·008Å), β 99°15′±10′, space group $P2_1/c$, $Z=4$. The tructure proposed for baddeleyite by Náray-Szabó [M.A. 3–410] is incorrect. The structure is a combination of luorite-like layers parallel to (100) in which oxygens are etrahedrally coordinated, with layers in which oxygens are n triangular coordination. Zr is in seven-fold coordination, with Zr–O ranging from 2·04 to 2·26Å. Zr–O distances are ompared with those in other Zr compounds ; charge balance nd twinning are discussed. [M.M. **21**–168]

J. Z.

TROTTER (J.) & BARNES (W. H.). *The structure of vanadinite.* Canad. Min., 1958, **6**, 161–173, 3 figs.

From precession and oscillation photographs around the two principal axes, vanadinite $Pb_5(VO_4)_3Cl$ is shown to be isostructural with apatite [M.A. **4**–462 ; **5**–184, 316] with space-group $P6_3/m$; a 10·331, c 7·343Å, both ±·001Å ; D (meas.) 6·861 g/cc, D (calc.) 6·887 g/cc; $Z=2$. The structure was refined by 2-dimensional F_0 and F_0–F_c Fourier projections, and the slight shifts of the atomic positions from those in mimetite determined. The most important features of the structure are : the octahedral coordination of Cl by Pb_{II}, these groups forming a chain along c ; the distorted tetrahedral coordination of V by O ; and the coordination of Pb_I by 9O. Interatomic distances are discussed, and compared with those in other vanadates. Tables of atomic coordinates, F_0 and F_c, and standard deviations of atomic coordinates and interatomic distances are given.

R. B. F.

WICKERSHEIM (K. A.) & BUCHANAN (R. A.). *The near infrared spectrum of beryl.* Amer. Min., 1959, **44**, 440–445, 1 fig.

Four polarized infrared absorption spectra of beryl are given. Differences in these spectra indicate that more than one type of molecular impurity can exist in beryl with variance in their concentration. The absorption bands suggest the presence of weakly bound water molecules with their H–H distances parallel to the c axis. Also alkali or alkaline earth hydroxide molecules may be present lying lengthwise to the beryl channels.

B. H. B.

TAKANO (Y.) & TAKANO (K.). *Apparent polytypism and apparent cleavage of the micas.* Journ. Min. Soc. Japan, 1958, **3**, 674–692, 7 figs. [In Japanese ; English summary, ibid., 802–803]

Examination of xanthophyllite showed it to consist of hexagonal plates of three or six individuals forming a rotational twin, which are also repeated vertically as a parallel growth or polysynthetic twin. The crystal structure is also pseudo-hexagonal ; most of the twins have a common c axis : xanthophyllite is iso-structural with 1M type muscovite. The abnormal optical properties of the mineral are due to the presence of twinning. The growth mechanism of xanthophyllite is discussed. [M.A. **6**–239, **8**–15, **10**–301, **11**–430]

R. A. H.

KERN (R.) & GINDT (R.). *Contribution à l'étude des accolements réguliers des feldspaths potassiques et des plagioclases.* Bull. Soc. franç. Min. Crist., 1958, **81**, 263–266, 2 figs.

Epitaxial growth of plagioclase on microcline was observed to follow two laws :– on (001) and on (010) of microcline with [100] direction in common. For the second orientation a structural interpretation is offered on the basis of the quasi-continuity of the three-dimensional Si–Al–O networks.

J. Z.

CURIEN (H.) & KERN (R.). *Plan de macle, plan de composition originel et plan de composition dans les macles formées à la croissance.* Bull. Soc. franç. Min. Crist., 1958, **81**, 344.

If the 'original composition plane' [Curien & Kern, 1957, Bull. Soc. franç. Min. Crist., **80**, 111] coincides with the twin plane, a contact twin results ; if these two planes do not coincide, the result is generally a penetration twin, or else a twin with rhombic section as composition plane. J. Z.

Sunagawa (I.). *Crystal growth of hematite from Ayumikotan, Japan.* Journ. Min. Soc. Japan, 1958, **3**, 543–556, 2 figs., 3 pls. [In Japanese : English summary, ibid., 795–796]

The three types of pyramids on the basal plane of a crystal of hematite from an andesitic lava are described. These consist of triangular layers with spiral growth, triangular layers with no spirals, and growth pyramids formed by screw dislocation with a layer thickness of one to four unit cells. It is believed that the crystal grew under conditions of comparatively high supersaturation.

R. A. H.

Hill (V. G.). *Phase transformation in zinc sulphide.* Canad. Min., 1958, **6**, 234–259.

A study of phase transformation in the zinc sulph system at atmospheric pressure by X-ray diffractome single-crystal, and microscopic methods shows that 3C : 2H equilibrium is at 1020°C±5°C and that it is me stable. At 1010°C±10°C the 4H polytype is the sta phase and, from the determination of the cubic-hexago packing relationship with temperature, it is suggested t all the polytypes have a stability range between that of 2H and 3C polymorphs. On this basis the 3C : 2H transit is seen to be of the diffuse first-order type. The react trend in the development of a polytype near the 2H : equilibrium temperature is 3C → 3C : 2H (intergrowth) polytypes, or 2H → 2H : 3C (intergrowth) → polytypes. If reaction temperature is far removed from the 2H : 3C me stable equilibrium temperature, then this transformat from 2H to 3C or vice versa first occurs, and thereafter polytype develops from the intergrowth and/or polymo first formed. It is suggested that the nucleation and grov of the various phases is a probability function dependent starting material, temperature, and reaction time. [Autho abstract]. [M.A. **13**–267, **14**–279] R. B. F

ECONOMIC MINERALS AND ORE DEPOSITS

Mertie (John B., *Jr.*). *Quartz crystal deposits of southwestern Virginia and western North Carolina.* Bull. U.S. Geol. Survey, 1959, **1072-D**, 233–298.

All the quartz deposits are in areas where the bedrock is dominantly schist or gneiss. Almost all the high-grade quartz suitable for use as oscillator plates occurs as residual concentration at the surface of the ground and in the upper part of the soil as a result of long continued weathering. Most of the quartz crystals are of low grade. Crystals twinned according to the Brazil law are much more common than those twinned according to the Dauphiné law. The quartz originated at low temperature and suffered little or no deformation after formation. K. S.

Carlson (H. D.). *Origin of the corundum deposits of Renfrew County, Ontario, Canada.* Bull. Geol. Soc. America, 1957, **68**, 1605–1636, 13 figs.

Corundum is erratically distributed through a banded complex of rocks rich in scapolite, nepheline, and plagioclase feldspar of composition An_{30} to An_{40}, but is more abundant and uniformly present in contact-zones between this banded complex and a younger hybrid alkali syenite. The petrography and chemistry of both the banded complex and the syenite gneiss complex, of which the hybrid alkaline syenite is the most important member, are described in detail with the aid of thirty new chemical analyses. The scapolite-plagioclase-nepheline gneiss complex may have formed either by the metasomatic alteration of intercalated c careous and aluminous metasediments, or by the intrus of sill-like masses of an anorthositic magma into such me sediments. The hybrid alkaline syenite is believed to ha been developed by metasomatism of the rocks of the ear complex, with the addition of K and Si and the release of Na, and Al from the scapolite-plagioclase-nepheline co plex. Much of the corundum of the contact zones attributed to the release of alumina from the older ro during the transformation into syenite [M.A. **11**–148].

R. A. H

Wiid (D. de N.). *The Pella corundum-sillimanite depos* Cape Town (Salesian Press), 1955, 20 pp., 21 figs.

These alumina-rich rocks occur in the south-west corner of Pella Mission Farm, in Namaqualand, and have average mineral composition of sillimanite 53%, corund 41%, ilmenite 2·77% and rutile 1·19%. The average val from 29 chemical analyses are SiO_2 19·68, Al_2O_3 74· Fe_2O_3 1·63, TiO_2 2·49, ign. loss 1·28 = 99·73, the individ Al_2O_3 values being between 85·97 and 58·01. The surrou ing rocks are granitized sediments and it is considered t the sillimanite-corundum rocks are the metamorpho products of alumina-rich sedimentary bodies. The mate is being used by the refractory industry and there is above-ground reserve of 400,000 tons ; separation of ilmenite and rutile may be of future economic importa [M.A. **8**–320].

R. A. H

RTHOLOMÉ (P.). *The Gore Mountain garnet deposit, New York. Structure and petrography.* Studia Univ. Lovanium, Fac. Sci., Léopoldville, 1958, no. 6, 32 pp., 19 figs., 2 pls.

This deposit of garnet, in the centre of the Adirondacks, curs at the contact of an olivine gabbro, with corona ucture, and a body of syenitic gneiss, and between these found a thin lens of troctolite related to the gabbro. All e rocks in the region of the deposit have been affected by orogenic episode, which is later than the intrusions of ivine gabbro, and the following syenites, into the heart of ie Adirondack massif of anorthosite. The gabbro-gneiss ntact is not a post-orogenic fault but follows pre-orogenic lations between the intrusions. Transformation of the ivine-gabbro to noritic gneiss, then to the garnet-amphibo-te which forms the 'dark-ore' is described. The feldspathic octolite passes to garnet anorthosite which is the 'light re'. The two types of ore are the result of the same kind of etrogenetic process affecting different rocks. The dark ore composed of large porphyroblasts of red garnet sheathed black hornblende, set in a grey, granular aggregate of ornblende and plagioclase. The garnets of the light ore are ometimes fine polyhedral, pure crystals, sometimes lobate oecilitic crystals full of inclusions of plagioclase ; their natrix is granoblastic anorthosite with a small proportion of ornblende, biotite, and an iron mineral.

J. Th.

BROBST (D. A.). *Barite resources of the United States.* Bull. U.S. Geol. Survey, 1958, **1072-B**, 67–130.

The greatest production of baryte is now obtained from leposits in Arkansas and Nevada (bedded deposits), Missouri and Georgia (residual deposits). Demonstrated eserves amount to about 46 million tons of baryte and nferred reserves amount to about 67 million tons. The nineralogical associations differ only slightly according to he type of deposit, bedded, residual, vein or cavity-filling.

K. S.

[BONDAR (V. G.)] Бондарь (В.Г.). О месторождении целестина, связанном с гидротермальной деятельностью траппов на территории сибирской платформы. [*On the deposit of celestite connected with the hydrothermal activity of traps on the territory of the Siberian platform.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.] 1959, **88**(2), 177–180, 3 figs.

Intrusive dolerite sills belonging to the Siberian Traps formation have produced a new type of hydrothermal deposit. It is formed in the tuffs adjoining the intrusion, and is composed of celestite with which galena, pyrite, marcasite, and chalcopyrite are associated.

S. I. T.

HARDIN (G. C., *Jr.*) & TRACE (R. D.). *Geology and fluorspar deposits, Big Four fault system, Crittenden County, Kentucky.* Bull. U.S. Geol. Survey, 1959, **1042-S**, 699–724.

Mining activity began in 1874. Primary minerals are fluorite, sphalerite, galena, marcasite [M.A. **3**–459], calcite, and quartz. Minor secondary minerals are smithsonite, pyromorphite, anglesite, and cerussite. The fluorspar veins are fissure fillings along faults and in fault breccia, and some fluorspar replaces early vein material and wallrock. Residual concentration of high-grade fluorspar in the overburden constitutes an additional important source of ore. K. S.

GROGAN (R. M.). *Structure due to volume shrinkage in the bedding-replacement fluorspar deposits of southern Illinois.* Econ. Geol., 1949, **44**, 606–612.

Fluorspar is the chief ore mineral, but sphalerite and galena are also of major importance. Common accessory minerals are calcite, quartz, baryte, chalcopyrite, marcasite, and pyrite. Most of the fluorspar occurs as banded replacement ore in distinct beds that range from a few inches to 3 feet or more in thickness. The mechanism of volume shrinkage appears to be a combination of volume reduction caused by stoichiometric replacement of calcite in limestone by denser fluorite, and volume loss by removal of limestone by solvent mineralizing fluids. W. A. Wh.

WELLER (J. M.), GROGAN (R. M.), & TIPPIE (F. E.). *Geology of the fluorspar deposits of Illinois.* Illinois State Geol. Survey, 1952, Bull. 76, 147 pp.

The fluorspar deposits are of three types : vein, bedded replacement, and residual. The fluorite occurs chiefly in limestones of Mississippian age. The fluorine is considered to have come from an igneous source at depth. It is not known whether the initial emanation at depth was liquid or gaseous but inclusions of liquid suggest that the fluorite was deposited in its present site from liquid solution. The temperature of formation ranged from 83° to 167°C as measured from liquid inclusions. The solutions probably carried fluorine, zinc, lead, copper, iron, sulphur, silicon, and barium. The minerals associated with the fluorite are calcite, quartz, baryte, chalcopyrite, pyrite, marcasite, witherite, strontianite, smithsonite, cerussite, malachite, pyromorphite, and sphalerite. W. A. Wh.

BENSUSAN (A. M.). *Notes on muscovite mining in Southern Rhodesia.* Trans. Inst. Mining Metall., London, 1957, **66**, 155–164, 3 figs.

Includes a brief outline of the geology of the muscovite-bearing pegmatites of the Urungwe and Darwin districts of Southern Rhodesia. R. A. H.

Mulligan (Robert). *Lithium deposits of Manitoba, Ontario, and Quebec*, 1956. Geol. Surv., Canada, 1957, Paper 57–3, 26 pp.

This paper reviews the main geological features of Canadian lithium deposits in the Preissac-Lacorne district of Quebec ; the Cat Lake-Winnipeg River, Herb Lake, and East Braintree-West Hawk districts of Manitoba ; the Yellowknife-Beaulieu district, Northwest Territories ; and the Nipigon, Dryden, Lac la Croix, Root Lake, Falcon Lake, and O'Sullivan Lake districts of Ontario. It includes short notes on physical properties, uses, and prices of lithium and its compounds, mineralogy, tests for minerals, and methods of evaluating lithium deposits. R. J. T.

Gooch (Edwin O.). *Vermiculite in the Virginia Piedmont.* Virginia Journ. Sci., 1957, **8**, 330–331.

Vermiculite and the related mica-vermiculites are found in Louisa County, Buckingham County, Bedford-Franklin counties, Pittsylvania-Franklin counties, Henry County and Charlotte-Halifax counties. R. S. M.

[Petrov (V. P.) & Sokolova (L. A.)] Петров (В. П.) и Соколова (Л. А.). Аспагашское месторождение хризотил-асбеста. [*The Aspagash deposit of chrysotile-asbestos.*] Труды института геологии рудиых месторождении, петрографии, минералогии и геохимии. [Trans. Inst. Geol. Ore-deposits, Petr. Min. Geochem.], 1957, No. 17, 85–106, 15 figs.

The asbestos deposit of Aspagash, Krasknoyarsk region in Siberia, is described. Asbestos-bearing ophicalcites are found along the contact zone of Cambrian dolomites and micro-granite, syenite, and spessartite dykes. Several chemical analyses of rocks and one of asbestos are given, and the genetic history of the deposit is outlined. S. I. T.

Airey (N. M.). *Operations at the Ethel asbestos mine, Southern Rhodesia.* Trans. Inst. Mining. Metall., London, 1957, **66**, 25–37, 4 figs., 2 pls.

Since the earlier description of the geology of this asbestos deposit [M.A. **4**–413] the presence of a pyroxenite 'floor' has been established, against which the chrysotile asbestos zone ends abruptly. R. A. H.

[Ivanov (A. A.)] Иванов (А. А.). Основы геологии и методика поисков, разведки и оценки месторождений минеральных солей. [*Principles of the geology and methods of prospecting, surveying and evaluation of deposits of mineral salts.*] Госгеолиздат [Gosgeolizdat], Moscow, 1953, 204 pp., 55 figs. Price 9r. 65k.

This is a relatively short, compact, and comprehensive treatise on salt deposits. It contains considerable data relating to the Soviet Union deposits of salt. The conte of the book are as follows : description of minerals, roc and types of deposits (pp. 6–33) ; present day geologi factors of salt accumulation (pp. 34–57) ; former geologi factors and conditions of salt deposition (pp. 58–8 tectonics, hydrogeology, and metamorphism of salt depos (pp. 82–115) ; prospecting, surveying, and evaluation of s deposits (pp. 116–198) ; bibliography (pp. 199–202). S. I. T.

Christ (C. L.) & Garrels (R. M.). *Relations among sodi borate hydrates at the Kramer deposit, Boron, Californ* Amer. Journ. Sci., 1959, **257**, 516–528.

Present relations among the minerals borax, tincalconi and kernite, and new and old laboratory studies of vap pressure and solubility in the system $Na_2B_4O_7$–H_2O sh that the ore body was primarily deposited as borax on t floor of a saline lake at 25° to 35°C. Subsequent burial about 2500 ft, with heating to 53° to 63°C, converted t borax to kernite by a slow reaction which took place mo readily at the bottom than at the top of the depos Dehydration of borax to tincalconite on the walls of mi openings, and rehydration back to borax in sealed workin subject to water seepage are explained by comparison wi the known crystal structures of the colemanite–meye hofferite–$2CaO.3B_2O_3.9H_2O$–inyoite series, where conve sions between the higher hydrates are easy, but changes or from colemanite are difficult because of the differe degrees of polymerization of the anions. This comparis shows that the formulas should probably be writt as follows : kernite, $Na_2B_4O_6(OH)_2.3H_2O$, tincalconi $Na_2B_4O_5(OH)_4.3H_2O$, borax $Na_2B_4O_5(OH)_4.8H_2O$. T postulates of similar and discrete polyanions in borax an tincalconite *versus* chains in kernite, readily explain certa stability anomalies that followed from the former assum tion that these minerals are simply three different hydrate $Na_2B_4O_7,nH_2O$, with $n=4$, 5, and 10. H. W.

Sanyal (J.), Das (R.), & Roy (S.). [*China clay resources the state of West Bengal. III.* Indian Ceram., 1958, 73.] Brit. Ceram. Abstr., 1959, abstr. 621.

The physical properties and analyses are given for samples ; the best contained 96·7% clay. A. G. C.

Banerjee (S. K.). [*Mineral resources of West Benga* Indian Ceram., 1958, **5**, 192.] Brit. Ceram. Abstr 1959, abstr. 1208.

China clay, fireclay, and kyanite are reported. A. G. C.

Gordon (Mackenzie, *Jr.*), Tracey (Joshua I., *Jr.*), Ellis (Miller W.). *Geology of the Arkansas baux region.* Prof. Paper U.S. Geol. Survey, 1958, **29** 268 pp., 39 pls. Price $8·25.

The Arkansas bauxite region [M.A. **1**–383, **2**–453, **10**–367, –212] covers more than 275 sq. miles. The surface rocks nsist of steeply dipping Paleozoic strata, gently dipping rly Cenozoic strata, late Cenozoic alluvial deposits, and kalic igneous rocks—nepheline syenite and porphyritic kalic syenite—which intrude the Paleozoic sediments and e overlain by Cenozoic. Weathering of the igneous rocks, iefly in early Eocene, provided the material for the auxite deposits. Two coarsely granular varieties of pheline syenite are the principal source rocks : nepheline enite ['foyaite '] and pulaskite ; these are cut by many nall dike rocks of similar composition : pegmatite, girine tinguaite, nepheline syenite, miarolitic nepheline enite, quartz syenite, and lamprophyric dikes (fourchite nd monchiquite). Gibbsite is the principal ore mineral ; it ccurs in crystalline and cryptocrystalline forms, in two enerations, and is commonly pseudomorphous after feldpar. Cliachite [= β-kliachite] is not colloidal, for thermal nd chemical analyses and X-ray diffraction studies indicate is gibbsite. Boehmite occurs sparingly. Kaolinite is the rincipal, halloysite, now positively identified from the egion for the first time, a common impurity. Iron mpurities occur as siderite, hematite [δ–Fe_2O_3, a substance itherto unknown in nature, occurs as a black opaque ineral in the magnetic fraction of heavy minerals], oethite, magnetite, and pyrite. Ilmenite, sphene, anatase, nd rutile occur in minor amounts. Minor accessory inerals are chlorite, chamosite, zircon, baryte, fluorite, ourmaline, kyanite, and garnet.

Concentrations of elements more abundant than Al in auxite, relative to nepheline syenite, are Cr, Cu, Ga, Nb, nd Mo ; those less abundant than Al are Zr, Ti, Sc, V, Be, Mn, Y, and Pb ; and those depleted are Sr, La, Ba, Ca, and Mg.

Most of the bauxite (27·7 million tons were shipped from 1896 to 1949) is used for metallurgical purposes but minor mounts are utilized by the abrasives, refractory, chemical, il-refining, and cement industries. K. S.

Haines (David V.). *Core logs from Searles Lake, San Bernardino County, California.* Bull. U.S. Geol. Survey, 1959, **1045-E**, 139–317.

The deposit consists of two buried beds of saline minerals, each about 39 sq. miles in area, with maximum thicknesses of 95 and 54 ft, respectively. A seam of clay or marl separates the two bodies. Minerals that generally occur in the evaporite bodies are halite, trona, hanksite, borax, burkeite, thenardite, aphthitalite ; minerals generally associated with clay and marl seams are gaylussite, pirssonite, dolomite, aragonite, nahcolite, tychite, schairerite ; and minerals that occur with equal abundance in both environments are northupite and sulphohalite. K. S.

Smith (G. L.), Almond (Hy), & Sawyer (D. L.). *Sassolite from the Kramer borate district, California.* Amer. Min., 1958, **43**, 1068–1078, 3 figs.

Sassolite (H_3BO_3), not reported hitherto from this district, was found near the base of borate-bearing shales underlying the ore body. Soda, borate, and sulfate are the major water-soluble constituents in the sassolite-bearing rocks. Considering phase relationships in the system Na_2SO_4–$Na_2B_4O_7$–H_3BO_3–H_2O conditions for sassolite deposition can be approximated, viz. acidic solutions above 35°C. These solutions were probably formed during leaching of the ore body borates by acidic sulfate groundwater. Optical, morphological, and X-ray powder data are given for sassolite and copiapite ; an analysis of copiapite shows it to contain iron and sulfate with minor copper and phosphate. B. H. B.

Iwao (S.). *Alunite deposits in Japan.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 229–234.

Alunite deposits are listed and the more important bodies, with analyses of the ores, are described. Mineral paragenesis, sequence of mineralization, and ore genesis are briefly discussed. W. A. W.

Saito (Matasugu). *The ore deposit of Gumma iron mine : a typical example of the jarosite occurrences found in Japan.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 226–229.

A brief list of jarosite occurrences in Japan and a description of the Gumma limonite-jarosite deposit are given. The genesis of the deposit is discussed. [See M.A. **11**–211, 212 for chemical and optical data, given in a previous paper on this locality, and reproduced in the present paper.] W. A. W.

[Zkhus (I. D.)] Зхус (И. Д.) К вопросу о роли глинистых минералов в процессе нефтеобразования. [*On the role of clay minerals in the process of oil formation.*] Доклады Акад. Наук СССР [C.R. Acad. Sci. U.S.S.R.] 1958, **123**, 353–356.

The suggestion is made that the hydromica, so abundant in the petroleum source beds, is a product of hydromicazation of montmorillonite. The transformation of the original organic matter into hydrocarbons, assisted by the catalytic effect of clay minerals, is brought about by the energy released on the hydromicazation of montmorillonite, a process followed by a compaction in the packing of atomic layers. S. I. T.

Cleveland (George B.). *Poverty Hills diatomaceous earth deposit, Inyo County, California.* Calif. Journ. Mines Geol., 1958, **54**, 305–316.

K. S.

Lamar (J. E.). *Siliceous material of extreme southern Illinois.* Illinois State Geol. Survey, 1953, Rept. Invest. 166, 39 pp.

The siliceous materials are silica, novaculite, ganister, 'calico rock' and chert gravels. Silica occurs in the Lafayette, Hartline, Clear Creek, Grassy Knob, and Bailey formations. Physical and chemical data and economic uses are given.

W. A. Wh.

British Standards Institution. *Sand for making colo less glasses.* Brit. Std. 2975, 1958, 19 pp.

Methods of inspection for impurities, sampling, grading, and the determination of moisture, SiO_2, Al, total Fe, TiO_2, and Cr_2O_3 are given. R. A. H.

Goldman (H. B.). *Sand and gravel for concrete aggreg* California Journ. Mines Geol., 1956, **52**, 79–104.

K. S.

EXPERIMENTAL MINERALOGY

Roy (Rustum). *Silica O, a new common form of silica.* Zeits. Krist., 1959, **111**, 185–189, 1 fig.

A new polymorphic form of SiO_2 is reported and is shown to be a relatively common substance at room temperatures in synthetic productions. Its structure is essentially the same as that of high-temperature quartz; the X-ray powder data are tabulated. Silica O represents a solid solution series from SiO_2 towards $LiAlO_2$: for the end member the refr. ind. is near 1·53. Following Sosman's suggestion [M.A. **12**–410] that new forms of silica which do not occur in nature should be distinguished by a letter suffix, the structural family here described is called *silica O* in honour of E. F. Osborn, founder of an active silicate research group at the Pennsylvania State University.

R. A. H.

Muan (Arnulf). *On the stability of the phase $Fe_2O_3.Al_2O_3$.* Amer. Journ. Sci., 1958, **256**, 413–422, 3 figs.

The stability range is 1318–1495°C at 1 atm. pO_2, decreasing to a univariant point at 1318°C at 0·03 atm. pO_2. The phase has not been found in nature, temperature never having been high enough to convert the assemblage spinel-corundum-hematite. W. T. H.

Muan (Arnulf). *Phase equilibria in the system manganese oxide–SiO_2 in air.* Amer. Journ. Sci., 1959, **257**, 297–315, 3 figs.

At temperatures from 990° to 1571°C, with oxygen partial pressure that of the open atmosphere (0·21 atm.), the following phases were detected in a pseudo-binary system diagram Mn_3O_4–SiO_2: cristobalite, tridymite, a braunite solid solution series $Mn_2O_3+SiO_2$, in which the substitution is $Mn^{II}(Mn^{IV},Si^{IV})O_3$, a rhodonite-like solid solution phase that contains excess Mn. Compositions of natural braunite should vary with the temperature and partial O_2-pressure at the time of formation of the mineral. H. W.

Glasser (F. P.). *The system MnO–SiO_2.* Amer. Journ. Sci., 1958, **256**, 398–412, 4 figs.

The completed phase diagram for this system shows that tephroite melts congruently at 1345°C, and rhodonite incongruently at 1291°C. These phases are identical with natural minerals. The ranges manganosite–tephroite a tephroite–rhodonite are eutectic, and rhodonite–cris balite is mainly liquid immiscibility. W. T. H.

Liebau (F.), Sprung (M.), & Thilo (E.). *Chemische Un suchungen von Silicaten. XXIII. Über das Sys $MnSiO_3$–$CaMn(SiO_3)_2$.* Zeits. anorg. Chem., 1958, **2** 213–225, 3 figs.

Three crystalline forms are identified in the range 0 about 20 mol.% $CaSiO_3$. These have rhodonite, bustam and pseudowollastonite-like structures: X-ray powder d are tabulated. Only the last two structures are found samples with more than 20 mol.% $CaSiO_3$. Contradictio between the complete solid solutions of synthetic MnS and $CaSiO_3$ indicated by Voos and the miscibility g between natural rhodonite and bustamite are explained terms of the polymorphism of $MnSiO_3$. R. A. H.

Wyart (J.) & Sabatier (G.). *Mobilité des ions silicium aluminium dans les cristaux de feldspath.* Bull. S franç. Min. Crist., 1958, **81**, 223–226, 2 figs.

—— —— *Nouvelles observations sur la mobilité des io silicium et aluminium dans les cristaux de feldspa* Ibid., 1959, **82**, 216.

Starting with labradorite, treatment with molten KCl h yielded a 'plagioclase' in which the sodium has been large replaced by potassium. Hydrothermal treatment of t potassic 'plagioclase' with a solution of KCl at 500°C ga potassium feldspar and anorthite in epitaxial growth. the absence of water even a pressure of 15,000 bars 500°C for 24 hours did not give a segregation of these t phases. Water is thus believed to have an important cat lytic action in the migration of Si and Al. Such reactio may be responsible for such microclinization of plagiocla as has been reported in a Pyrenean gneiss [Guitard, Bu Soc. géol. Franç., 1955, **5**, 441]. R. A. H.

Kakitani (S.) & Fujisaka (M.). [*Solid phase reacti between calcium carbonate and silica.* Togyo Kyokai S 1958, **66**, 133, 8 figs.] Brit. Ceram. Abstr., 1959, abs 291. A. G. C.

ANNAQUIS (N.) & GUINIER (A.). *La transition polymorphique β–γ de l'orthosilicate de calcium.* Bull. Soc. franç. Min. Crist., 1959, **82**, 126–136, 5 figs.

The inhibiting effect on the β–γ transformation of Na_2SiO_4 by impurities held in solid solution does not explain the ansformation from the stable to the unstable form brought out by prolonged heating. The inhibiting effect of Na_2O, $_2O$, and CaO becomes noticeable above a certain value; or Na_2O the effect is most noticeable when 1 mol. is substituted for 200 mol. of silicate. The mean grain size of the crystals is shown to be an important factor in the transformation; this has been evaluated for pure stoichiometric γ–Ca_2SiO_4 at 525°C. [M.M. **29**–875; M.A. **11**–470, **12**–97, 11]. R. A. H.

OTH (R. S.) & LEVIN (E. M.). *Polymorphism in barium disilicate.* Amer. Min., 1959, **44**, 452–453.

Sanbornite, $BaSi_2O_5$, is the low temperature polymorph of barium disilicate. A phase transformation at about 350°C to a high temperature form is sluggish but reversible. The two forms can be distinguished by X-ray diffraction but the respective optical indices differ by less than 0·002.

B. H. B.

NURSE (R. W.), WELCH (J. H.), & GUTT (W.). *High-temperature phase equilibria in the system dicalcium silicate-tricalcium phosphate.* Journ. Chem. Soc., 1959, 1077–1083, 1 fig.

The system presents a continuous series of solid solutions with a melting-point maximum at 2240°C, contradicting earlier findings. A new high-temperature form of $3CaO.P_2O_5$ has been discovered. At lower temperatures two compounds are formed by solid-state reactions; silicocarnotite is stable below 1450°C and a new phase, denoted as 'A', stable below 1125°C, has the approximate composition $7CaO.P_2O_5.2SiO_2$. X-ray powder data are given for each phase in the system. [M.A. **8**–312, **9**–92] R. A. H.

AVGUSTINIK (A. I.), KOZLOVSKII (L. V.), & KONOVALOV (P. F.). [*Effect of heat on muscovite.* Zh. Fiz. Khim., 1957, **31**, 2495.] Brit. Ceram. Abstr., 1959, abstr. 365.

A. G. C.

TUTTLE (O. F.) & SMITH (J. V.). *The nepheline-kalsilite system. II. Phase relations.* Amer. Journ. Sci., 1958, **256**, 571–589, 5 figs.

Experimental investigation of the subsolidus, up to 1000 kg/cm², reveals a miscibility gap between nepheline, $Na_3KAl_4Si_4O_{16}$, and kalsilite, $KAlSiO_4$. In this same composition region but at temperatures above 1000°C, the new compound tetrakalsilite [M.A. **14**–54], $K_3NaAl_4Si_4O_{16}$, is probably stable but has not been found in nature. Kaliophilite, $KAlSiO_4$, is probably metastable at all temperatures. Hexagonal $NaAlSiO_4$ transforms to orthorhombic (?) above 850°C, but the relations to nepheline are uncertain. Kalsilite transforms to orthohomic $KAlSiO_4$ above 840°C. Phase relations in the ternary system with SiO_2 are discussed.

W. T. H.

BARRER (R. M.), BAYNHAM (J. W.), BULTITUDE (F. W.), & MEIER (W. M.). *Hydrothermal chemistry of the silicates. Part VIII. Low-temperature crystal growth of aluminosilicates, and of some gallium and germanium analogues.* Journ. Chem. Soc., 1959, 195–208, 3 figs., 6 pls.

The hydrothermal crystallization of aluminosilicates between 60° and 250°C has been investigated using hydrous gels of compositions $Na_2O.Al_2O_3.nSiO_2(1 \leqslant n \leqslant 12)$ in the presence of excess NaOH. Analcite, mordenite, zeolites of the harmotome, faujasite and chabazite groups, a zeolitic phase related to rhodesite [M.M. **31**–611], 'basic' sodalite, 'basic' nosean, and a phase related to nepheline hydrate were obtained. From mixed Na,K-aluminosilicate gels the products included sanidine, kalsilite, and bayerite. The growth mechanism of the various aluminosilicate structural patterns is discussed. R.A.H.

MUMPTON (F. A.). [*Stability studies of the zircon-thorite group and the effect of related oxides.* Thesis, Pennsylvania State Univ., 1958.] Brit. Ceram. Abstr., 1959, abstr. 1141.

The monoclinic–tetragonal inversion for 'pure' ZrO_2 has been located at 1170°±15°. The systems ZrO_2–ThO_2, ZrO_2–UO_2 and ThO_2–UO_2 have been studied at sub-solidus temperatures between 300° and 1400° and the limits of stable and metastable solid solutions have been delineated. The extent of solid solution in the $ZrSiO_4$–$ThSiO_4$–'$USiO_4$' range is discussed. A. G. C.

SCHUILING (R. D.). *Kyanite-sillimanite equilibrium at high temperatures and pressures—Discussion.* Amer. Journ. Sci., 1958, **256**, 680–682, 2 figs.

CLARK (SYDNEY P., *Jr.*), ROBERTSON (EUGENE C.), & BIRCH (FRANCIS). *Reply.* Op. cit. 1958, **256**, 683–684.

Schuiling's correlation of natural occurrences [M.A. **13**–607] indicates that the triple point with kyanite must lie at a lower pressure and higher temperature than the linear extrapolation of the experimental curve of Clark, Robinson, and Birch [M.A. **13**–639]. These authors in reply to Schuiling point out his temperatures and pressures are based on assumptions regarding pressure-temperature relations in metamorphism and on highly indirect correlations with laboratory studies of other systems.

W. T. H.

Gelsdorf (G.), Müller-Hesse (H.), & Schwiete (H.-E.). [*Saturation experiments on synthetic mullite and substitution by gallium oxide and germanium oxide.* Arch. Eisenhüttenw., 1958, **29**, 513, 4 figs.] Brit. Ceram. Abstr., 1959, abstr. 631.

With rising temperature mullite can be saturated with Al_2O_3 up to a limiting composition of $2Al_2O_3.SiO_2$, a linear relationship being found between lattice constants and Al_2O_3 content. Reaction between mullite and B_2O_3 results in the formation of a solid solution composed of the end-members $3Al_2O_3.2SiO_2$ and $9Al_2O_3.2B_2O_3$ with partial separation of SiO_2. Substitution by Ga_2O_3 and GeO_2 resulted in the formation of various isotypes of mullite. A compound $Ga_2O_3.GeO_2$ forms by solid state reaction at 1300°C and corresponds to andalusite. A. G. C.

Fujii (T.) & Eitel (W.). *Reaktionen im festen Zustand im System MgO–MgF_2–SiO_2 : Solid state reactions in the system MgO–MgF_2–SiO_2.* Radex Rundschau, 1957, **1**, 445–469, 9 figs. (In German and English : German, English and French summaries.)

The system MgO–MgF_2–SiO_2 is of considerable technological importance as well as being of interest in connection with skarn formation. Most of the experimental mixes were heated for 3 hours at 1200°C but some were heated for longer periods at 1000°C. Norbergite and chondrodite formed easily, but clinohumite less easily. Humite was only identified once. X-ray data for the synthetic and natural fluorhumite minerals are compared. The presence of magnesium fluoride was found to promote the quartz-cristobalite inversion. A. G. C.

Gillery (F. H.) & Hill (V. G.). *The X-ray study of synthetic Mg–Al serpentines and chlorites.* Amer. Min., 1959, **44**, 143–152, 1 fig.

Hydrothermal conditions of synthesis for the production of Mg-Al chlorite and serpentine polytypes are examined. Temperature has the greatest effect on determining which mineral will be produced, whereas the composition determines the polytype. Chlorites are formed hydrothermally via serpentine structure and if the process does not attain stability a serpentine results. Below 500°C serpentines of possible chlorite composition appear to be metastable with respect to chlorite. A. C. H.

Sudo (T.) & Matsuoka (M.). *Crystallization of volcanic glass by alkali salt solutions.* Journ. Min. Soc. Japan, 1958, **3**, 514–522, 3 figs. (in Japanese : English summary, ibid., 793).

The digestion of glassy tuff with NaCl and NaOH solutions yielded sodalite and a zeolitic material. In concentrated alkaline solutions sodalite was formed, while the formation of zeolite was favoured by lower concentratio X-ray powder data are given for the products. R. A. H

Ellis (A. J.). *The solubility of carbon dioxide in water high temperatures.* Amer. Journ. Sci., 1959, **257**, 21 234, 6 figs.

Composition of the gas was measured for CO_2–H_2O in t range 100–350°C. Measurements were all near two syste compositions : about 0·001 and 0·0025 (mole) fraction C component. Pressures were calculated from the pure H saturation line, assuming no interaction, and are genera within 5 bars of the line. Distribution coefficients we calculated assuming densities of liquid and gas equal those of the pure H_2O phases. The distribution coefficien or Henry constants are consistent with previously publish data below 100°C. The gas distribution is discussed in ter of a quasi-lattice model of liquid structure. The da indicate the danger of extrapolating low-temperature da in terms of solubility, which reverses sharply at 130°C. the other hand, the distribution coefficent varies smooth and monotonically up to the critical region. The da supplement the phase diagrams of Khitarov and Malin [M.A. **13**–601]. W. T. H.

Ellis (A. J.). *The solubility of calcite in carbon dioxi solutions.* Amer. Journ. Sci., 1959, **257**, 354–365.

Solubility of calcite in water is reported for temperatur between 100–300°C and partial pressures of CO_2 of 1– atm. Values for the free energy change of solution an solubility product are derived. Rate studies indicate t Arrhenius activity energy as 2500 cal. Desorption of calciu ions is possibly rate determining. L. S. W.

Wyllie (P. J.) & Tuttle (O. F.). *Melting of calcite in t presence of water.* Amer. Min., 1959, **44**, 453–45 2 figs.

Investigations in the system CaO–MgO–CO_2–H_2O sho calcite is partially melted at 740°C in the presence of wat vapor at a pressure of 1000 bars. In the CaO–CO_2–H_2 system on the CaO side of the calcite-water join meltin begins at 675±5°C at 1000 bars. Two isobaric diagram for the binary systems $CaCO_3$–H_2O and CaO–CO_2 are give Four isobaric isothermal diagrams for the ternary syste CaO–CO_2–H_2O are given, to show how rapidly the propo tion of liquid decreases as the percentage of water decrease Applications of this work to emplacement of carbonatite deformation of limestones, and contact metamorphism limestones are briefly discussed. B. H. B.

Wyllie (P. J.) & Tuttle (O. F.). *Synthetic carbonati magma.* Nature, 1959, **183**, 770.

In the system CaO–CO_2–H_2O the minimum liquidu

mperature at 1000 bars pressure is 675°±5°C with composition CaO 64, CO_2 18, H_2O 18 (wt. %). At 680°C and 00 bars another liquid forms with composition CaO 68, O_2 19, H_2O 13 (wt. %). At 685°C the two liquid fields alesce. At 4000 bars, the minimum liquidus temperature 640°C, and below 50 bars it is also lowered (665°C at bars). The effects of MgO, SiO_2, and other components the system are under investigation. The detailed results ill be published later. [M.A. **13**–176] M. J. Le B.

ENNEDY (GEORGE C.). *Phase relations in the system Al_2O_3–H_2O at high temperatures and pressures.* Amer. Journ. Sci., 1959, **257**, 563–573, 3 figs.

For temperatures 100° to 600°C, and H_2O-pressures 0 to 0,000 atmospheres, new data delineate the regions of ability (or metastability for boehmite) of gibbsite, ayerite, diaspore, boehmite, and corundum. At 40,000 tmospheres H_2O-pressure the maximum temperature for ibbsite is 295°, and for diaspore is about 590°. Intersections of boundaries gibbsite–diaspore, gibbsite–metastable boehmite, and diaspore–metastable boehmite is near 6 kilobars and 260°C; that of boundaries diaspore–orundum, diaspore–metastable boehmite, and metastable oehmite–corundum is near 150 bars and 350°C. Boehmite robably has no field of stability, and diaspore appears to e capable of forming under other than high-pressure high-emperature conditions; these conclusions accord with field nd laboratory data. H. W.

HEMLEY (J. JULIAN). *Some mineralogical equilibria in the system K_2O–Al_2O_3–SiO_2–H_2O.* Amer. Journ. Sci., 1959, **257**, 241–270, 6 figs.

Experiment, using dilute HCl–KCl solutions established he occurrence and reversibility of the reactions $\frac{3}{2}$ K-eldspar$+H^+ = \frac{1}{2}$mica$+3SiO_2+K^+$, mica$+H^+ + \frac{3}{2}H_2O =$ kaolinite$+K^+$. Spontaneous alteration of K-feldspar to nica+cristobalite and of mica to kaolinite can be accomplished in solutions of 0·15*M*HCl–0·5*M*KCl. The reactions were studied in the temperature range 200°–500°C at pressures of 2×, 5×, 15×, and 30×10^3lb/in^2. Equilibrium was approached from both directions; the extent of the reactions was determined by glass electrode pH measurements; reaction products were identified by X-ray powder diffraction patterns. At 350°C the reaction mica$+H^+ = \frac{3}{4}$ pyrophyllite$+\frac{3}{4}$ boehmite$+K^+$ occurs; above 400°C, perhaps as low as 420°C, mica$+H^+ = \frac{1}{2}$ pyrophyllite+andalusite$+H_2O+K^+$ takes place. Equilibrium quotients (*M*KCl:*M*HCl) were determined at 400°C, 15,000 lb/in^2; activity coefficients for 0·1, 0·01, 0·001 *M*HCl-4, 2, 0·7 *M*KCl at 200°, 300°, and 400°C. The reactions are exothermic; heats of reaction are mica–boehmite–pyrophyllite −12·2, mica–kaolinite −13·7, mica–K-feldspar–silica −16.0 kcal/moleH$^+$. The free energy drive of hydrolysis decreases with increasing temp.; standard values in kcal/moleH$^+$ for K-feldspar–mica–silica vary from −10·6 at 200°C to −7·42 at 500°C, for mica–kaolinite −6·7 at 200°C to −2·83 at 500°C. Thus alteration potential of hydrothermal solution would increase with decreasing temperature provided the rate of migration were sufficiently rapid in comparison with the rate of reaction with wall-rock. The effect of solution pressure on the equilibria is relatively small; increasing pressure increases the extent of hydrolysis. D. H.

SAHA (PRASENJIT). *Geochemical and X-ray investigation of natural and synthetic analcites.* Amer. Min., 1959, **44**, 300–313, 4 figs.

Analcite was crystallized from glass-water mixtures, ranging from $NaAlSiO_4$ (nepheline) to $NaAlSi_3O_8$ (albite), sealed in gold envelopes and run for 1 month. The water content of the synthetic analcites varies directly with silica content. A similar trend was found in plotting 59 natural analcite compositions from the literature. Optical and X-ray data indicate the d_{639} spacing and cubic lattice constant also vary linearly with silica content, but the refractive index varies non-linearly. Previous structural investigations of analcite are reviewed, and a table compiling 86 analyses is given. B. H. B.

ELLIS (A. J.). *The system Na_2CO_3–$NaHCO_3$–CO_2–H_2O at temperatures up to 200°C.* Amer. Journ. Sci., 1959, **257**, 287–296.

Equilibrium conditions in the system were studied by a differential vapor pressure method; K for the dissociation of $NaHCO_3$ was derived. The mean activity coefficient of Na_2CO_3 is shown to decrease with rising temperature. L. S.

JANSEN (GEORGE J.), MAGIN (GEORGE B., *Jr.*), & LEVIN (BETSY). *Synthesis of bastnaesite.* Amer. Min., 1959, **44**, 180–181.

Bastnäsite was synthesized by first producing the basic carbonate [$Ce_2O(CO_3)_2.4H_2O$], which was then dispersed in hot water in a CO_2 atmosphere and the stoichiometric amount of dilute HF(1/1000) slowly added. The reaction product was kept in a CO_2 atmosphere and digested on a steam bath for 5 days. The product was identified by X-ray powder diffraction. A. C. H.

MAGIN (G. B., *Jr.*), JANSEN (G. J.), & LEVIN (BETSY). *Synthesis of sabugalite.* Amer. Min., 1959, **44**, 419–422.

Sabugalite has been synthesized by combining uranyl acetate dihydrate and aluminium chloride hexahydrate in aqueous solution with excess phosphoric acid. Chemical analyses and X-ray powder data for natural and synthetic sabugalite are tabulated and are similar. B. H. B.

Geller (S.) & Miller (C. E.). *The synthesis of uvarovite.* Amer. Min., 1959, **44**, 445–446.

Uvarovite was synthesized by heating a pressed mixture of $3CaO+Cr_2O_3+3SiO_2$ at 1400°C for 2 hours. Indexed X-ray powder data are tabulated; the lattice constant is $12{\cdot}00\pm{\cdot}02$ Å, significantly larger than that of natural uvarovite samples. [M.A. **11**–196] B. H. B.

Longchambon (Louis), Bloch (Jean-Michel), & Durand (Georges). *La montmorillonite dans la vanadinite.* C.R. Acad. Sci., Paris, 1957, **244**, 1799–1801.

Experimental work shows that montmorillonite may play an essential role in the genesis of vanadinite. Montmorillonite attracts and concentrates the Pb^{2+} and Cl^- ions, fixes the humic colloids containing vanadates, and facilitates their reaction. E. J.

Durand (Georges). *Sur la synthèse de la vanadinite.* C.R. Acad. Sci. Paris, 1957, **244**, 2621–2622.

Synthesis of vanadinite has been effected at room temp. by reaction of aqueous solution of humic acids and ammonium vanadate on a montmorillonite in which lead chloride is fixed. E. J.

Wyart (J.) & Sabatier (G.). *Transformation des sédiments pélitiques à 800°C sous une pression d'eau de 1800 bars et granitisation.* Bull. Soc. franç. Min. Crist., 1959, **82**, 201–210, 9 figs.

Two clays, two marls, and a slate, whose chemical analyses are tabulated, and also various synthetic products of similar composition, have been heated to 800°C at a water pressure of 1800 bars. The ferromagnesian elements became concentrated in crystals of biotite, cordierite, and spinel which were in equilibrium with a liquid phase of granitic composition in which silica and the alkalis were concentrated. The genesis of granite and gneiss is discussed in the light of these experiments. R. A. H.

Stubbles (J. R.) & Birchenall (C. E.). *A redetermination of the lead–lead sulphide equilibrium between 585° and 920°C.* Trans. Metall. Soc. AIME, **215**, 535–538, 1 fig.

Inconsistencies in published data led the authors to re-evaluate the system which was investigated under a circulating atmosphere of $H+H_2S$ between 585 and 920°C; the equilibrium atmospheres were analyzed by an iodometric method. The data are represented by a linear free energy equation for the formation of PbS in the temperature range:

$$2Pb_{L}+S_{2(g)} = 2PbS_{(s)} \qquad \triangle F^\circ = -77{,}280+41{\cdot}3T\text{cal}$$

Reasons are given for accepting the new data. R. G. Wls

Dickson (F. W.) & Tunell (George). *Equilibria of HgS (cinnabar) and black HgS (metacinnabar) and the saturated solutions in the systems HgS–Na_2S–H_2O and HgS–Na_2S–Na_2O–H_2O from 25°C to 75°C at 1 atmosphere pressure.* Amer. Journ. Sci., 1958, **256**, 654–67[illegible] 15 figs.

Extensive solubility data are presented in tables and graphs, agreeing reasonably well with Knox (1906), but not Saukov (1946). Metacinnabar was more soluble than cinnabar throughout the range of measurement; cinnabar transforms to metacinnabar only above 344°C. Solutions can carry geologically significant amounts of HgS throughout the range of temperature and composition studied, and will precipitate cinnabar by dilution with pure water, by raising of the temperature, or by reaction with more acid solutions, with oxidizing substances, or with sulfur. W. T. H.

Bernal (J. D.), Dasgupta (D. R.), & Mackay (A. L.). *Oriented transformations in iron oxides and hydroxides.* Nature, 1957, **180**, 645–647, 3 figs.

When lepidocrocite is heated to 250°C a poorly crystallised spinel phase, identified as maghemite, is produced which subsequently changes to hematite with some crystal growth. Both the products are oriented with respect to the phase from which they are formed. The mechanism of the transformations can be deduced from the crystal structures of the compounds. The orientation relationship observed for the second transformation has also been verified for the isomorphous magnetite-ilmenite transformation. C. H. K.

GEMSTONES

Jessop (J. E., *Jr.*). *Glittering oasis.* Gems & Gemology, 1958, **9**, 232–239.

A brief description of the Consolidated Diamond Mines alluvial concession at the mouth of the Orange River in South West Africa and the methods of recovery used. J. A. H.

Webster (R.). *Some diamond problems.* Journ. Gemmology, 1959, **7**, 79–100, 14 figs.

A review of difficulties which may be encountered in the positive identification of diamonds, with particular emphasis on the artificial coloration of gem diamonds by bombardment with sub-atomic particles. Comparisons a

ade with natural and synthetic materials which may nulate diamond. 54 references. R. A. H.

LLIOTT (R. J.), MATTHEWS (I. G.), & MITCHELL (E. W. J.). *The polarization of luminescence in diamond.* Phil. Mag., 1958, ser. 8, **3**, 360–369.

Experiments on a diamond cut to the form of a cube ounded by {100} faces, and using light travelling normal the faces, demonstrate that the polarization of luminesnce from a cubic crystal, when excited by plane polarized ght, may be used to determine the symmetry axes of the uminescent centres. For the specially cut diamond the reen emitting centre induced by heat treatment (800°C) fter irradiation has been shown to have symmetry axes long [110]. R. A. H.

USTERS (J. F. H.) & RAAL (F. A.). *Fundamental absorption edge of diamond.* Nature, 1957, **179**, 268–269, 2 figs.

Light absorption measurements on plates of varying hickness split from two diamonds suggest that the type II bsorption edge is the normal fundamental one for diamond nd that type II diamonds contain fewer imperfections han type I. C. H. K.

EAL (M.). *The abrasion of diamond.* Proc. Roy. Soc. London, 1958, **248**, **A**, 379–393.

The rates of wear for diamond abraded with diamond owder vary by a factor of >500 for different crystallographic directions. The variation is related to a small irectional variation in the coefficient of friction. The ifference observed in behaviour at high and low sliding peeds is consistent with wear being due principally to a hermally activated chemical effect. R. A. H.

BOWDEN (F. P.) & SCOTT (H. G.). *The polishing, surface flow and wear of diamond and glass.* Proc. Roy. Soc. London, 1958, **248**, **A**, 368–378.

The wear of diamond sliding on glass is due partly to the degradation of diamond to amorphous carbon or graphite. This degradation appears to occur at interface temperatures lower than that required for obvious graphitization of diamond heated without rubbing. R. A. H.

HALPERIN (A.). *An uncommon growth feature in diamond.* Phil. Mag., 1958, ser. 8, **3**, 1057–1060.

Growth features which extend as terraces from the edges of growth sheets on {111} faces of a diamond are described. One of these features is very flat, probably down to atomic dimensions over its whole area ($\frac{1}{3} \times \frac{1}{2}$ mm). Its characteristics suggest that in the last stage of growth of a diamond, when trigons are formed on its surface, growth sheets become frozen and growth proceeds only to the fixed edges. R. A. H.

FRANK (F. C.), PUTTICK (K. E.), & WILKS (E. M.). *Etch pits and trigons on diamond I.* Phil. Mag., 1958, ser. 8, **3**, 1262–1272.

Clusters of triangular depressions (trigons) have been observed on the faces of a type I diamond octahedron and appear to be associated with a centre of strain in the interior of the stone. The trigon patterns indicate that they resulted from surface dissolution : there is evidence that these particular trigons are centred on dislocations. It is concluded that most trigons are etch pits ; the usual laboratory etch agents develop pits oppositely oriented to trigons and possible explanations of this are considered. R. A. H.

FRANK (F. C.) & PUTTICK (K. E.). *Etch pits and trigons on diamond II.* Phil. Mag., 1958, ser. 8, **3**, 1273–1279.

Artificial etching of diamonds by steam and chlorine at temperatures of around 800°C produces etch pits in 'positive' orientation (i.e. opposed to that of natural trigons). Diamonds heated in fused kimberlite at about 1450°C develop sharp-edged triangular pits in 'negative' trigon orientation. The bearing of this observation on the natural history of diamond is briefly discussed. R. A. H.

WILKS (E. M.). *The cleavage surfaces of type I and type II diamonds.* Phil. Mag., 1958, ser. 8, **3**, 1074–1080.

Microscopy and multiple-beam interferometry have been used to show that, in general, there are more cleavage lines on type I diamonds, and also a greater number of the so-called 'river systems'. The results suggest that impurities within the lattice lead to a more broken substructure in the type I diamonds. Any birefringence does not appear to be related to the cleavage pattern ; very few type II diamonds show evidence of a laminated structure. R. A. H.

TOLANSKY (S.), HALPERIN (A.), & EMARA (S. H.). *On the occurrence of slip in diamond.* Phil. Mag., 1958, ser. 8, **3**, 675–679.

Linear discontinuities strictly in {111} planes have been observed on natural {111} faces of diamonds and have been studied optically. Their characteristics suggest that they originated in slip which could well have occurred while the diamond was still growing and presumably hot. R. A. H.

DESNOYERS (J. E.) & MORRISON (J. A.). *The heat capacity of diamond between* 12·8° *and* 277°K. Phil. Mag., 1958, ser. 8, **3**, 42–48.

The heat capacity of 160 g of diamonds has been measured in the temperature range 12·8° to 277°K and the results resolve some of the uncertainties about the thermal properties of diamond. The form of the low frequency spectrum is not unlike that of certain other cubic crystals. R. A. H.

Hall (G. G.). *The electronic structure of diamond, silicon and germanium.* Phil. Mag., 1958, ser. 8, **3**, 429–439.

A mathematical treatment is given permitting a more detailed description of the electronic structure of diamond. R. A. H.

Anderson (B. W.) & Webster (R.). *Variations in the luminescence of emerald.* Gemmologist, 1959, **27**, 41–45.

Natural and synthetic emeralds show a fluorescent effect when excited by X-rays. Ultra-violet fluorescent lamps emitting light in the range between 3100 to 4100 Å were found best for distinguishing between synthetic emerald and its natural counterpart. Low pressure short-wave and medium pressure long-wave lamps gave less satisfactory results. G. F. A.

Zodac (P.). *Opal pseudomorphs after asbestos from Arizona.* Rocks & Minerals, 1959, **34**, 129.

Opal pseudomorphs after asbestos are found in the Blue Mule asbestos mine in Bear Canyon, Gila County, about 45 miles east of Globe, Arizona. Opal replaces compact serpentine as well as the asbestos veins in the serpentine. Colors of the opal pseudomorphs vary from golden yellow to brown to white. R. S. M.

Daniel (Bob). *Gem sillimanite from Oconee County, S. C.* Rocks & Minerals, 1959, **34**, 52.

Gem quality brown sillimanite crystals, varying from 1 to 30 g. in weight, have been found in Oconee County, South Carolina. Cabochons of this material show cat's eye chatoyancy. R. S. M.

Breitweiser (Wayne R.). *Dryhead agate—Prize of the fortifications.* Rocks & Minerals, 1959, **34**, 206–209, 3 figs.

Fortification agate, resembling the agate from Fairbu South Dakota, is found in the 'Dryhead Country', an a adjacent to the Big Horn River between the Big Horn a Pryor Mountains in northern Wyoming and southe Montana. The agate colors are red, yellow, pink or brow The fortifications consist of straight and curved lin swirls, and eyes, and include bands of quartz crystals. In s they vary from ½ inch to over 3 inches across. R. S. M

Sinkankas (John). *A new orthoclase moonstone.* Rocks Minerals, 1959, **34**, 195–198.

Translucent, greenish or yellowish orthoclase moo stone, exhibiting a silvery opalescence, is found at t O. W. Harris farm, Goochland County, Virginia. The fe spar occurs as 'eyes' enveloped in foliated greenish alter mica in a dark grayish-green schist. The largest 'e noticed measured 24 by 6 inches. The plane of opalescen is normal to (010) and is inclined about 20° to (00 Description of the diaphaneity, 'snowflake' inclusions, a the colour of the material is given. R. S. M.

Laitakari (Aarne). *Some unusual stones in Finla* Rocks & Minerals, 1959, **34**, 297.

A brief summary is given of some gemstones found Finland. Minerals considered are chrome-diopside, alman ine, cordierite, quartz, native gold, and staurolite twi R. S. M.

Owens (George W.). *Out of the ordinary in cabocho* Rocks & Minerals, 1959, **34**, 22–25.

Suggestions are given for cutting and polishing cabocho of smithsonite, variscite, rhodonite, thomsonite, calci sodalite, and chiastolite. R. S. M.

MINERAL DATA

Takeuchi (T.) & Nambu (M.). *On cubanite in Japan (Studies on the minerals of Cu-Fe-S series in Japan, second report).* Sci. Rept. Tohoku Univ., ser. 3, 1958, **6**, 1–10, 2 figs., 2 pls.

Massive cubanite from Omine mine, Iwate Prefecture, gave on chemical analysis Cu 23·91, Fe 40·95, S 35·06, Ni 0·06, Zn tr., SiO_2 0·16, =100·14, and similar material from Kamaissi mine, Iwate Prefecture, gave Cu 23·30, Fe 41·23, S 34·81, Ni 0·11, Zn 0·03, SiO_2 0·51, =99·99. Both contained a minute quantity of lamellar chalcopyrite and hair-like pyrrhotine formed by unmixing. X-ray powder data are recorded. Cubanite-bearing ores from many other Japanese localities and their texture and paragenesis are reviewed. R. A. H.

Takeuchi (T.) & Nambu (M.). *Maghemite from Takanoku mine, Fukushima Prefecture.* Journ. Min. Soc. Japa 1958, **3**, 486–491, 3 figs. (in Japanese; English su mary, ibid., 792).

Supergene maghemite associated with hematite a goethite occurs in the weathered surface of the contact me somatic magnetite deposits of Takanokura mine. Chemi analyses, X-ray powder data, and d.t.a. curves are giv for the maghemite (A), goethite (B), and magnetite (C).

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	S	H_2O+	H_2O-	Tot
A	1·22	0·31	92·06	3·12	—	—	0·38	2·08	99·
B	2·16	0·57	82·95	tr.	0·39	0·08	10·98	2·30	·99·
C	0·03	0·19	68·95	30·82	0·02	tr.	0·01	0·03	100·

Also: for both B and C, TiO_2 tr., MnO tr., MgO tr., P tr.

R. A. H.

IBUYA (G.). *On maghemite from the Kumano mine, Yamaguchi Prefecture, and its oxidation by the heating (Report I).* Journ. Min. Soc. Japan, 1958, **3**, 640–659, 5 figs., (in Japanese ; English summary, ibid., 801).

The primary magnetite ore of metasomatic deposits sociated with a quartz diorite contact with limestone is ered by secondary or hydrous oxidation to maghemite, matite, lepidocrocite, and goethite. Four specimens of aghemite were analysed (A–D) ; some of them were heated air at from 300° to 1000°C and the heated products udied by X-ray and chemical methods. It is suggested at the oxidation process involves the genesis of vacancies octahedral coordination positions, the movement of Fe^{3+} ions in tetrahedral coordination to octahedral sitions, and the change of lattice symmetry from cubic to igonal. The higher the degree of deficiency, the lower is ie temperature of the last exothermic peak on the d.t.a. urve.

SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	H_2O	Total	D_4^{11}	a(Å)
3·57	1·30	77·14	17·46	tr.	0·33	0·09	99·95	4·970	8·349
1·02	0·51	75·95	22·10	0·10	tr.	0·00	99·76	4·899	8·386
1·57	0·11	83·53	10·66	tr.	2·76	0·57	99·31		8·382
3·00	2·83	78·35	13·98	0·93	tr.	0·65	99·84		8·344

Also : A, B, C, D—TiO_2, tr., nil, nil, nil ; MnO 0·06, 0·08, 0·11, 0·10 respectively.

R. A. H.

ATANABE (T.). *On the occurrence and paragenesis of magnesium-borate minerals in dolomite contact skarns.* Journ. Min. Soc. Japan, 1958, **3**, 747–762, (in Japanese ; English summary, ibid., 806–807).

New occurrences of magnesium-borate minerals in dolo- ite-granite contact aureoles in Japan and Korea are ecorded and include kotoite, suanite, ludwigite, paigeite, arwickite, and szájbelyite. The paragenesis of borate inerals of other localities are summarized. [M.M. **29**–621 ; I.A. **3**–273, **7**–315, **11**–338] R. A. H.

ARON (G.), CAILLÈRE (S.), LAGRANGE (R.), & POBEGUIN (TH.). *Étude du Mondmilch de la grotte de la Clamouse et de quelques carbonates et hydrocarbonates alcalino-terreux.* Bull. Soc. franç. Min. Crist., 1959, **182**, 150–158, 8 figs.

The extremely fine-grained whitish Ca-Mg concretions ound in caves are discussed. Huntite has been described M.A. **14**–80] from the grotto of la Clamouse and here its d.t.a. and thermogravimetric curves and infrared spectra re compared with those for calcite, dolomite, aragonite, giobertite [= magnesite], strontianite, witherite, vaterite, ydromagnesite, and nesquehonite. The huntite gave endo- hermic peaks at 500° and 900°C. [M.A. **12**–132] R. A. H.

BROADHURST (F. M.) & HOWIE (R. A.). *On the occurrence of ankerite in a band of non-marine lamellibranchs from the Lancashire Coal Measures.* Geol. Mag., 1958, **95**, 397–402, 1 pl., 1 fig.

The shell-substance of the non-marine lamellibranchs from a band in the Lower *similis-pulchra* Zone of Lancashire was identified as ankerite. Pockets of the same mineral sometimes occur within the shells. Chemical analysis by R. A. Howie of light yellow ankerite forming the shell substance in material from Oak Victoria Colliery, Oldham, gave SiO_2 0·15, TiO_2 tr., Al_2O_3 0·28, Fe_2O_3 0·10, FeO 12·06, MnO 0·77, MgO 12·85, CaO 29·23, Na_2O 0·06, K_2O 0·01, CO_2 44·70, H_2O- 0·02, =100·23, approximating to $(Mg_2Fe)Ca_3(CO_3)_6$; ε 1·515, ω 1·710, sp. gr. 2·97. [M.A. **14**–196] M. G. B.

KITAHARA (J.). *Chromian enstatite from Hirose mine, Tari district, Tottori Prefecture.* Journ. Min. Soc. Japan, 1958, **3**, 539–542, 1 fig., (in Japanese ; English summary, ibid., 795).

Enstatite from a fissure in a chromite pyroxenite occurs in tabular crystals with well developed {010} faces and additional forms {100}, {010}, and {101} : it is associated with andradite. The enstatite is pale green and sub-transparent ; colourless in thin section, with α 1·664, β 1·667, γ 1·672, $2V_\gamma$ 61·5° ; sp. gr. 3·234, H. 5½. Chemical analysis gave SiO_2 54·01, TiO_2 0·03, Al_2O_3 3·95, Fe_2O_3 2·07, Cr_2O_3 0·57, FeO 1·57, MnO 0·00, MgO 35·65, CaO 0·99, NiO 0·09, Na_2O 0·08, K_2O 0·00, H_2O 0·59, =99·60. R. A. H.

MINATO (H.) & MURAOKA (H.). *Deweylite from Horokanai-mura, Hokkaido, Japan.* Journ. Min. Soc. Japan, 1958, **3**, 626–633, 3 figs., (in Japanese ; English summary, ibid., 800).

Yellowish or brownish deweylite occurs as amorphous masses associated with serpentine in Horokanai-mura, Uryu-gun, Hokkaido. It is brittle with a conchoidal fracture, vitreous or greasy lustre, refr. ind. <1·54, H. 2–3 ; decomposed by HCl. Under the microscope it has a spherulitic texture, with an amorphous appearance or weak birefringence. Chemical analysis by H. Minato gave SiO_2 41·62, TiO_2 nil, Al_2O_3 0·06, Fe_2O_3 0·03, FeO 1·35, MnO tr., MgO 33·89, CaO 0·06, H_2O+ 17·60, H_2O- 6·13, =100·74. The thermogravimetric curve and X-ray powder pattern are figured. [M.A. **12**–54, 583] R. A. H.

FAUST (G. T.), HATHAWAY (J. C.), & MILLOT (GEORGES). *A restudy of stevensite and allied minerals.* Amer. Min., 1959, **44**, 342–370, 8 figs.

A restudy of stevensite shows that it is not an interlayered talc-saponite mineral, as suggested by Brindley, but is rather a montmorillonite group mineral with a type of defect structure arising from a deficiency in the total number of ions in octahedral coordination. Chemical analyses, d.t.a. curves, X-ray diffraction patterns, infrared absorption spectra, solution studies in hot 10 *N* HCl, and

cation exchange capacities are compared. New chemical analyses are given: stevensite, Mine Creek, Bakersville, North Carolina, U.S.A., SiO_2 47·0, FeO 5·5, MgO 29·7, CaO 0·2, H_2O^+ 17·7, =100·1; ghassoulite, Djebel Ghassouel mine, Ksabi Province, Morocco, SiO_2 55·02, Al_2O_3 1·12, FeO 0·70, MgO 24·89, CaO 0·54, Na_2O 0·94, K_2O 0·43, H_2O^+ 6·42, H_2O^- 7·66, TiO_2 0·08, Li_2O 0·36, CO_2 0·30, F 3·22, =101·68. It is recommended that hanušite (=stevensite+pectolite) and ghassoulite (=hectorite) be relegated to the synonomy. B. H. B.

Bonatti (Stefano). *Chevkinite, perrierite and epidotes.* Amer. Min. 1959, **44**, 115–137, 12 figs.

Close morphological and structural ties exist between the chevkinites and epidotes. Chevkinites are not a single mineral species. Perrierite and monoclinic chevkinite are well identified. Values for unit cell for perrierite are: *a* 13·61, *b* 5·62, *c* 11·63 Å, β=113°28′, space group *C*2/*m*. The unit cell for chevkinite above, with *c* doubled and with (010) centered, gives *a* 13·56, *b* 5·82, *c* 23·94 Å, β=113°04′, which repeats the unit cell of perrierite with *c* doubled; it is in the following relationship with the unit cell of monoclinic epidotes: $\frac{4}{3}$ *c*, 1*b*, $\frac{8}{3}$ *a*, with β similar. A. C. H.

Kuno (H.). *Chromian diopside from Sano, Yamanasi Prefecture.* Journ. Geol. Soc. Japan, 1957, **63**, 523–526.

Diopside occurring as phenocrysts in a transgressive basalt sheet 1000 m northeast of Kozōri, Sano, Sakae-Mura, Nisiyatusirogun, Yamanasi Prefecture, Japan, has been analysed by Haramura and gave SiO_2 53·42, TiO_2 0·12, Al_2O_3 0·68, Cr_2O_3 0·56, Fe_2O_3 1·36, FeO 2·01, MnO 0·07, MgO 15·99, CaO 25·75, Na_2O 0·12, K_2O 0·06, P_2O_5 0·03, H_2O^+ 0·16, H_2O- 0·01, =100·34, with also NiO 0·016, V_2O_5 0·004. It has α 1·672–1·676, β 1·679–1·683, γ 1·699–1·703; $2V_\gamma$ 56° (av.), *r*>*v*, *c*:γ 39° (av). The diopside is rimmed by pale brown augite with 2V 46–50°, *r*>*v*.
R. A. H.

Filipenko (Y. S.). *Coffinite.* In Polikarpova (V. A.) & Ambartsumian (Z. L.), *New data on uranium minerals in the U.S.S.R.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 302 & 304.

Coffinite occurs in fissures in granite, associated with pyrite, galena, and chalcopyrite, all of which it antedates. It is brownish black, compact, with dull lustre, and conchoidal fracture; H. 2·9–3·1. In reflected light, it is grey with yellow-brown internal reflections; reflectivity 5·6–7·5%. Listed X-ray spacings are similar to those of U.S. coffinite; cell-dimensions are derived as *a* 7·01, *c* 6·26 Å. Microchemical analyses of impure material, including pyrite, quartz, sericite, and kaolinite, (A) from 33 m depth, (B) from 48 m depth, gave:—

	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	UO_3	UO_2	Na_2O	S	H_2O	T
A	26·92	17·88	2·51	1·34	1·91	17·63	25·05	—	3·0	7·86	·99
B	31·17	12·53	6·34	1·94	1·47	9·50	27·66	0·63	3·79	5·91	·99

R. K. H. & J. E. T. H

Mason (Brian). *Tephroite from Clark Peninsula, Wilk Land, Antarctica.* Amer. Min., 1959, **44**, 428–430.

Tephroite occurs in a black 'vein' of granoblastic textu with spessartine, rhodonite, and barite near the Wilk Station (about 66°S, 110°E) on Clark Peninsula, Antarctic Pleochroism α pale yellow, γ pale blue; α 1·770, β 1·80 γ 1·819; optically (−), 2V 71°; sp. gr. 4·08 and H. 6 chem. anal. of tephroite, containing about 2% spessartir SiO_2 29·31, Al_2O_3 0·48, Fe_2O_3 1·21, FeO 1·67, MnO 65·6 MgO 0·71, CaO 0·70, Na_2O 0·07, K_2O 0·00, TiO_2 0·0 P_2O_5 0·07, H_2O^+ 0·19, H_2O- 0·02, CO_2 0·00, =100·10. B. H. B.

Yoshimura (T.), Shirozu (H.), & Hirowatari (F *Bementite and pyroxmangite from the Ichinomata mir Kumamoto Prefecture.* Journ. Min. Soc. Japan, 195 **3**, 457–467, 3 figs., (in Japanese; English summar ibid., 791).

Bementite and pyroxmangite occur associated wi rhodochrosite and tephroite in the manganese ore depos of the Ichinomata mine, 18 km south of Yatsushiro Cit The bementite forms brown semi-transparent masses minute flakes with sp. gr. 3·03, H. 5½, α′ 1·631, γ′ 1·63 chemical analysis by F. Hirowatari gave SiO_2 35·55, Al_2 1·74, FeO 1·06, MnO 47·00, MgO 3·76, CaO 1·25, H_2O 8·68, H_2O- 1·41, =100·45. Pyroxmangite forms pinki grey masses, and sometimes occurs as minute fibro crystals in a radial arrangement; it has sp. gr. 3·26, H. α 1·717, γ 1·732, 2V 40°, and its analysis by F. Hirowata gave SiO_2 50·64, TiO_2 tr., Al_2O_3 0·00, Fe_2O_3 0·68, MnO 40·9 MgO 0·37, CaO 3·60, H_2O+ 2·53, H_2O- 1·00,= ·99·78 The d.t.a. curve for bementite, and X-ray powder data f bementite, pyroxmangite, and rhodonite are also give [M.M. **24**–573; M.A. **1**–176, **6**–528, **13**–596] R. A. H.

Koch (R. A.). *Über den Laumontit des Petersberges bei Hal a.d. Saale.* Neues Jahrb. Min., Monatshefte, 1958, 5 67, 3 figs.

Laumontite, occurring in drusy cavities with fluorit calcite, epidote, feldspar, quartz, and chlorite in the Hal quartz porphyry, is optically positive with α≈1·516–1·52 γ≈1·505–1·513, γ : *c* 38°; sp. gr. 2·26–2·29, H. 3½–4. Th mean of two chemical analyses by G. Schneidereit gav SiO_2 50·70, Al_2O_3 22·53, Fe_2O_3 0·04, CaO 11·54, Na_2O 0·4 K_2O 0·30, H_2O+ 12·00, H_2O- 2·41, =99·92. Stainin techniques for the identification of laumontite are reviewe the X-ray powder data are tabulated, and the d.t.a. an

ermogravimetric curves for the laumontite are illus-ated ; the d.t.a. curve has endothermic peaks at 300° and 0°C and exothermic peaks at 180–220° and 400°C. .A. **4**–325, **6**–132, **12**–170] R. A. H.

MORI (K.). *Mode of occurrence and chemical composition of Mg-vermiculite from Odaka and Uzumine, Fukushima Prefecture.* Journ. Min. Soc. Japan, 1958, **3**, 478–485, 6 figs., (in Japanese ; English summary, ibid., 792).

Mg-vermiculite occurs associated with anthophyllite or bestos and talc in narrow belts at the margin of serpentite in contact with pegmatites. Chemical analyses by H. onno are given for vermiculite from Uzumine (A) and om Odaka (B), Fukushima Prefecture.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	H_2O+	H_2O-	Total
A	35·54	0·50	11·42	7·20	0·15	24·79	0·08	9·46	11·65	100·80
B	34·88	0·42	13·15	8·26	0·44	24·24	0·10	8·58	9·91	100·16

Also : MnO 0·01, 0·18 in A and B respectively.

R. A. H.

ATH (R.) & PUCHELT (H.). *Dravit von Gouverneur.* Neues Jahrb. Min., Monatshefte, 1959, 22–24, 1 fig.

The dark brown tourmaline occurring with apatite and apolite in granular limestone near Gouverneur, St. awrence Co., New York, has been re-examined. The ptical properties for various wavelengths are tabulated, anging from ε 1·6222$_2$ for λ 480·0 ; to ε 1·6171$_7$, ω 1·6375$_1$ or λ 589·3 ; and ε 1·6145$_8$, ω 1·6338$_9$ for λ 623·4. The ean of three chemical analyses gave SiO_2 35·94, TiO_2 0·79, B_2O_3 10·94, Al_2O_3 28·92, Fe_2O_3 0·43, MnO 0·01, MgO 14·43, aO 3·82, Na_2O 1·09, K_2O 0·06, Li_2O tr., F 1·15, H_2O 3·07, ess O≡F 0·48, =100·17 : sp. gr. 3·045. R. A. H.

ASPERIN (M.). *Contribution à l'étude des bétafites.* Bull. Soc. franç. Min. Crist., 1958, **81**, 116–120.

When betafites from Madagascar are heated at around 00°C with the addition of 18% CaO, pyrochlore with *a* 0·22 kX is produced. If insufficient CaO is added pyro-hlore and strüverite are formed while with excess CaO yrochlore and perovskite are produced. It is suggested hat some natural betafites possibly may be derived from yrochlore by the loss of calcium from the latter mineral. M.A. **11**–434] R. A. H.

VAN WAMBEKE (L.). *Deux nouveaux minéraux belges: la turquoise d'Ottré et la ferrimolybdite de la tonalite de la Helle.* Bull. Soc. belge Géol., 1958, **67**, 455–459.

Crystals of turquoise, 1 to 2 mm., have been observed in veinlets of manganiferous quartz in the region of Vielsalm, Ardennes. Analysis by X-ray fluorescence was made. Refr. ind. are α 1·612, β 1·620, γ 1·648. X-ray powder data are given. Ferrimolybdite, α 1·720, β 1·730, γ 1·91, has been found as coatings on a veinlet of molybdenite. [M.A. **13**–404] F. Sch.

JEDWAB (J.). *Présence de torbernite à Richelle (province de Liège).* Bull. Soc. belge Géol., 1958, **67**, 300–303.

A description of crystals of torbernite, 0·05 to 0·5 mm, with forms {001} and {101}, found at Richelle, near Visé, Belgium. Chemical and optical properties are given and the radioactivity measured ; ε 1·586, ω between 1·591 and 1·595. F. Sch.

GAINES (RICHARD V.). *Brandtite at the Sterling Hill Mine, New Jersey.* Amer. Min., 1959, **44**, 199–200.

Brandtite at this mine occurs as small, colourless, slender, prismatic crystals ; cleavage {010} perfect and {001} good ; biaxial positive, with β 1·7070 and γ 1·7215 ; $r<v$ very strong ; 2V small $\approx 15°$. Material confirmed as identical with brandtite from Långban, Sweden. A. C. H.

SAKURAI (K.), KATO (A.), FUJIYAMA (I.), & IMAYOSHI (T.). *Coquimbite from Kōnomai mine, Hokkaido.* Journ. Min. Soc. Japan, 1958, **3**, 772–777, 5 figs., 2 pls., (in Japanese ; English summary, ibid., 808).

—— —— —— —— *Voltaite from Kōnomai mine, Hokkaido.* Ibid., 777–781, 6 figs., 1 pl. (808).

—— —— —— —— *Roemerite from Kōnomai mine, Hokkaido.* Ibid., 782–783 (808).

Coquimbite was found in an old adit of an Au-Ag vein, associated with hydrous sulphate minerals. The colour varies from whitish purple, to purple, and reddish purple. The mineral forms hexagonal plates on short {10$\bar{1}$0} prisms, with rare small faces *a* {11$\bar{2}$0} and *r* {10$\bar{1}$1}. Chemical analyses gave Al_2O_3 2·47 (4·01), Fe_2O_3 24·09 (22·07), FeO— (0·00), MnO 0·00 (0·00), MgO 0·00 (—), SO_3 41·68 (42·66), $H_2O\pm$ 31·77, (H_2O+ 28·06, H_2O- 3·24), =100·01 (100·04). Voltaite occurs on the coquimbite as small black crystals with *o* {111} and *a* {100} as principal faces, and *d* {110} ; *n* 1·600. Chemical analysis gave Al_2O_3 3·47, Fe_2O_3 12·28, FeO 11·33, MnO 0·31, MgO 3·48, CaO 0·02, Na_2O 0·05, K_2O 4·32, SO_3 46·56, H_2O+ 17·35, H_2O- 0·60, =99·77. Roemerite was also found as an aggregate of small chestnut brown platy crystals ; its analysis gave Al_2O_3 0·54, Fe_2O_3 20·01, FeO 8·10, SO_3 39·93, H_2O+ 6·92, H_2O- 23·93. X-ray powder data are given for the three minerals. [M.A. **10**–123] R. A. H.

OMORI (K.). *Some pegmatite minerals from southern Inner Mongolia.* Sci. Rept. Tohoku Univ., 3rd Ser., 1958, **6**, 25–38, 13 figs.

Muscovite from Erh-iau kou pegmatite, cutting pre-Cambrian gneiss near Kuan tsun, had the composition of analysis (A) and $2V_\alpha$ (calc.) 43°. Pale green apatite (B) from the same pegmatite is shown to have 72% fluor-apatite. Pale green beryl (C) from Su su kou pegmatite had H. 8, and ilmenite (D) from Wu hau shan pegmatite occurred

as a 2 kg crystal with minute irregular lamellae of hematite and rutile. All analyses by H. Konno.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	F
A	43·13	0·45	29·03	4·86	1·77	tr.	0·86	nil	2·15	2·14
B	1·98	nil	0·32	0·72	—	nil	0·09	54·22	—	2·60
C	64·79	—	17·86	0·55	—	—	0·26	0·48	0·74	—
D	—	48·41	—	28·63	22·37	0·67	nil	nil	—	—

	H_2O+	H_2O-	Total	ϵ	ω	Sp. gr.
A	4·36	3·20	100·14	(β1·598)	—	2·860
B	0·26	0·18	100·96	1·6388	1·6438	3·168
C	1·26	0·21	'100·14'	1·5647	1·5723	2·682
D	—	—	100·08	—	—	4·675

Also : A, Li_2O 0·09, K_2O 9·00, less F≡O 0·90 ; B, P_2O_5 40·96, Cl 0·94, less F≡O 1·10, Cl≡O 0·21 ; C, BeO 14·01.

R. A. H.

Paulose (C. V.). *The Odara pegmatite.* Econ. Geol., 1957, **52**, 702–708, 3 figs.

A complex zoned pegmatite occurs at Odara (9°22′ N. ; 76°38′ E.), in the Thiruvalla district in Central Travancore, India, cutting lateritized gneiss. The inner core contains quartz and aquamarine; an intermediate, typically pegmatitic, zone has quartz, perthite, beryl, columbite, muscovite, and magnetite; and the outer zone has disintegrated quartz, altered feldspar, muscovite, and magnetite. The sea blue aquamarine (A) has a poor {0001} cleavage with slight pleochroism, in thick fragments, from faint blue to colourless, and is from the inner zone. Yellow beryl (B) occurs in the intermediate zone, slightly pleochroic in thick fragments from very faint yellow to colourless, poor {0001} cleavage. Columbite has H. 6, sp. gr. 5·57, and gave Nb_2O_5 62·21, Ta_2O_5 9·83, SiO_2 tr., Fe_2O_3 3·57, FeO 13·50, MnO 10·77, U O 0·29, H_2O+ 0·00, H_2O- 0·02,='100·18' : analyses by C. V. Paulose. The origin of the pegmatite is discussed and the 'replacement theory' is rejected.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	BeO	CaO	Na_2O	K_2O
A	65·17	18·46	1·73	0·41	12·53	0·07	0·23	—
B	65·59	18·73	0·61	1·53	11·94	0·05	0·07	0·03

	P_2O_5	H_2O+	H_2O-	Total	sp. gr.	ω	ϵ	$\omega-\epsilon$
A	0·04	1·55	0·02	100·21	2·713	1·591	1·584	0·007
B	0·05	1·34	0·04	99·98	2·722	1·577	1·572	0·005

R. A. H.

Fisher (D. J.). *Pegmatite phosphates and their problems.* Amer. Min., 1958, **43**, 181–207, 6 figs., 8 tables.

—— *Addendum to the pegmatite phosphates.* Ibid., 609–610, 1 fig.

This is an appeal for simplification in naming and classifying minerals and mineral groups. As example the pegmatite phosphates are used ; four groups are discuss primary, later, supergene (confined to pegmatites) supergene (not limited to pegmatites). Variants in a spe like apatite could be characterized by chemical prefi Phosphate structures and crystal chemistry are briefly cussed and analogy with some silicates is shown. Unit dimensions and edge ratios, space groups, and strong X-ray lines are given for 81 phosphate minerals. A tabu alphabetical index gives strongest line, crystal system, (or c/a in dimetric system), and reference to the group ta Sixty X-ray powder photographs are given for qualitat visual comparison. The addendum gives data for and X-r powder photographs of 10 more phosphates.

B. H. B. & A. P

Rosenblum (Sam) & Lu (P. H. H.). *Differential therm curves of minerals from Taiwan.* Proc. Geol. Soc. Ch [Formosa], 1959, no. 2 (for 1958), 147–151, 7 figs., 1

A portable d.t.a. apparatus [M.A. **10**–482, **14**–15] been used to produce d.t.a. curves for quartz, talc, chlori antigorite, chloritoid, kaolinite, dickite, endellite [= hallo ite], montmorillonite, allophane, alunite, dolomite, calci and limonite from Formosa. The d.t.a. curves are figur and the localities listed. A chemical analysis is given kaolinite from Kinmen Island which had SiO_2 68·80, Al_2 21·42, Fe_2O_3 1·08, TiO_2 0·73, CaO 0·12, MgO 0·17, Na 0·29, K_2O 0·89, H_2O 6·46, =99·96, and a partial analysis chloritoid from Taroko Canyon, Hualien Hsien, gave Si 24·90, TiO_2 14·74, Al_2O_3 7·86, MnO 0·2, CaO 0·68, MgO 0· P 0·31, S 0·222, FeO 36·52. R. A. H.

Glasser (L. D.) & Roy (D. M.). *Further studies* $6CaO.3SiO_2.H_2O$. Amer. Min., 1959, **44**, 447–451, 1 fi 2 tables.

Unit cell parameters for $6CaO.3SiO_2.H_2O$ are as follow a 6·84, b 6·94, c 12·89 Å, all ±·02, α 90°45′, β 97°2 γ 98°16′, all ±10′ ; reciprocal cell data and an index powder pattern are also given. D.t.a. curves showed endothermic peak at 700°C. Dehydration curves are giv with the major weight losses at 550° and 650°C ; the e product was β-$2CaO.SiO_2$. The density, calculated fr the refractive indices, is 2·94, giving Z=1·99 and the c content of $12CaO.6SiO_2.2H_2O$. The water is probab contained as hydroxyl not attached to silicon. B. H. B.

NEW MINERALS

Caillère (Simone), Avias (J.), & Falgueirettes (Jean). *Découverte en Nouvelle Calédonie d'une minéralisation arsénicale, sous forme d'un nouvel, arséniure de nickel, Ni_2As.* C.R. Acad. Sci. Paris, 1959, **249**, 1771–1773.

The mineral appears in a vein in the serpentinized harzburgites of the Tiebaghi massif, as bronze-rose coloured masses, deeper in colour than niccolite. Chemical analy indicates its arsenic-nickel nature with exceptionally hi content of Ni. Microscopic examination shows that it a homogeneous mineral of lamellar aggregate structu enclosing scarce inclusions of pentlandite. These data alo with its reflectivity relative to that of niccolite a

aucherite exclude the hypothesis that the mineral is a xture of ferro-nickel and arsenides NiAs or $Ni_{1\cdot5}As$ and d to the conclusion that an arsenical-nickeliferous lattice th high content of Ni exists. Chem. anal. of impure aterial (9% antigorite, 1% hygroscopic $H_2O+Fe_2O_3$) dicates the presence of nickel combined with arsenic in a oportion very close to Ni_2As. Calc. sp. gr. 6·5. The ermal curve showed an exothermic break beginning at 0°C (575° for maucherite, 400° for niccolite). X-ray wder pattern shows that the material is distinct from aucherite and niccolite and different from synthetic Fe_2As d Ni_2Sb ; the strongest lines are 1·977 (10), 1·918 (10), 109 (4), 1·810 (4). Together the data prove a new mineral i_2As for which the name *orcélite* is proposed. E. J.

AWLEY (J. E.) & BERRY (L. G.). *Michenerite and froodite, palladium bismuthide minerals.* Canad. Min., 1958, **6**, 200–209, 4 figs.

Two palladium bismuthides discovered in the arsenic- nd lead-copper-rich fractions of the nickeliferous ores of the rood Mine, Sudbury, Ontario, in 1940 by C. E. Michener re described, using previously unpublished data and new bservations.

Michenerite, named after C. E. Michener, is greyish white ith a dull metallic lustre, black streak, no visible cleavage, rittle, H. 2·5, sp. gr. "probably about 9·5". In polished ection it is light grey and isotropic ; etch reactions are iven. From indexed X-ray powder data which are given, he mineral is shown to be cubic with the pyrite structure, 6·68Å ; the strongest lines are 2·99 (100), 2·01 (90), 2·73 80). Chemical analysis of a few milligrams gave the com- osition Pd_2Bi_3, but the similarity of the powder pattern to yrite indicates the composition is more likely $PdBi_2$.

Froodite, named after the Frood Mine, is grey ; streak lack ; lustre metallic, splendent on fresh cleavage, tar- ishes quickly ; fracture uneven ; brittle ; H. 2·5 ; sp. gr. 2·5 (natural), 11·5 (synthetic). Previously taken Weissen- erg photographs by H. Berman (natural material) and by Burr and Peacock (artificial α-$PdBi_2$) [M.A. **8**–363] showed he mineral to be monoclinic $C2/m$, cleavages (001) perfect, 100) less perfect, ($\bar{1}02$) poor ; a 12·75, b 4·29, c 5·67 [kX ?], β 102°52′ ; $Z=4$. Indexed X-ray powder data are given ; he strongest lines are 2·81 (80), 2·27 (60), 2·13 (60). In olished section froodite is light grey and anisotropic with olarization colours light to dark grey ; etch reactions are given. [A.M. **44**–207] R. B. F.

RAMDOHR (P.), AHLFELD (F.), & BERNDT (F.). *Angelellit, ein natürliches triklines Eisen-Arsenat,* $2Fe_2O_3.As_2O_5$. Neues Jahrb. Min., Monat., 1959, 145–151, 4 figs.

WEBER (K.). *Eine kristallographische Untersuchung des Angelellits,* $2Fe_2O_3.As_2O_5$. Ibid., 152–158, 2 figs.

Angelellite, a new mineral, occurs as dark brown triclinic crystals, associated with cassiterite and hematite in the fissure of an active oxidising fumarole on Cerro Pululus, north-west Argentina [22½°S., 67°W.]. Three analyses of impure material indicate a formula of $2Fe_2O_3.As_2O_5$. Angelellite has H. 5½, sp. gr. 4·87 ; a 5·03, b 6·49, c 7·11Å, α 114·4°, β 116·4°, γ 81·9° ; $Z=1$, space group C_1^1 ; 3 strongest X-ray powder reflections at 3·152, 2·958, 2·997Å ; $\alpha\approx2\cdot13$, $\gamma\approx2\cdot40$. The name is in honour of Dr. V. Angelelli, Director of the Geological Survey of Argentina. [A.M. **44**–1322] R. A. H.

MILTON (C.), MROSE (MARY E.), CHAO (E. C. T.), & FAHEY (J. J.). *Norsethite, $BaMg(CO_3)_2$, a new mineral from the Green River formation, Wyoming.* Bull. Geol. Soc. America, 1959, **70**, 1646 (abstract).

Norsethite occurs as small clear to milky white circular plates or flattened rhombohedral crystals in dolomitic black oil-shale below the main trona bed in the Westvaco trona mine, Wyoming, associated with shortite, labuntsovite, searlesite, loughlinite, pyrite, and quartz. It has H. 3½, sp. gr. 3·837 ; lustre vitreous to pearly ; fracture hackly ; good rhombohedral cleavage ; insoluble in water but readily decomposed by cold dilute HCl. Norsethite is uniaxial negative, ω 1·694, ε 1·519 ; a 5·02, c 16·75Å ; a_{rh} 6·29Å, α 47°02′ ; $Z=1$, probable space group R 32 (D_3^7) ; strongest X-ray reflections are 3·015Å (100), 3·860 (35), 2·656 (35), 2·512 (35), 2·104 (35), 1·931 (35), 1·864 (35). Forms observed $c\{0001\}$, $a\{11\bar{2}0\}$, $m\{10\bar{1}0\}$, and $r\{10\bar{1}1\}$. Chemical analysis (on 0·1 g) gave BaO 52·9, CaO 0·5, MnO 0·1, MgO 13·9, CO_2 31·2, Fe_2O_3 (total iron) 0·4, SiO_2 0·3; insol. 0·5, =99·8. The mineral is named in honour of Mr. Keith Norseth, engineering geologist of the Westvaco trona mine. R. A. H.

SAMBONSUGI (M.). *Ferri-phlogopite from Teshirogi district, Fukushima Prefecture, Japan.* Journ. Min. Soc. Japan, 1958, **3**, 634–639 (in Japanese : English summary, ibid., 801).

Brown mica from a pegmatite has α 1·558, γ 1·601 ; pleochroism α yellow—colourless, β yellowish brown, γ golden brown, absorption $\alpha<\beta<\gamma$; $2V_\alpha$ 12°. X-ray powder data are tabulated. Strongest lines are 3·45Å (100), 11·8 (70), and 2·62 (70). Chemical analysis gave SiO_2 37·78, Al_2O_3 24·15, Fe_2O_3 14·73, FeO 0·89, MgO 11·95, Na_2O 0·72, K_2O 4·22, F 0·22, H_2O- 4·97, H_2O+ 0·21, ='99·89'. The name ferri-phlogopite is proposed. R. A. H.

ESQUEVIN (JACQUES). *Sur la composition minéralogique des moresnetites et l'existence probable d'une nouvelle phyllite zincifère.* C.R. Acad. Sci. Paris, 1957, **244**, 215–217.

Attempts to synthesize zinciferous phyllites [M.M. **24**–621] led to the production of sauconite and of a 7Å phyllite, the zinc equivalent of berthierine. The presence of a natural

homologue of this zinciferous berthierine has been observed in the moresnetites and in vanuxemite, but the simple mixture is one remarked only in this note. E. J.

Polikarpova (V. A.) & Ambartsumian (Z. L.), editors. *New data on uranium minerals in the USSR.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses of Atomic Energy, 1958, **2**, 286–309, 29 figs., 31 tables.

This paper comprises sections by several authors on new or recently described minerals. Some of the data have already been abstracted from other papers as indicated below.

P. 286. Rudnitskaya (L. S.). *Calcium uranium molybdate* $Ca(UO_2)_3(MoO_4)_3(OH)_2.8H_2O$.

This mineral occurs as elongated prismatic crystals in radial sheaf aggregates. It is yellow with a honey tint, fluoresces bright yellow-green, is readily attacked by dilute acids. Elongation is positive, extinction straight, refr. ind. $>1{\cdot}758$, α almost colourless, γ bright yellow. Microchemical analysis gave SiO_2 3·86 (—), CaO 4·63 (3·91), UO_3 61·26 (58·65), MoO_3 19·90 (27·20), H_2O 10·90 (10·21), =100·55 (99·97); the values in brackets after correction for uranophane impurity. The mineral occurs in the lower part of the oxidation zone of hydrothermal U–Mo veinlet deposits. A d.t.a. curve is given. The strongest lines on the powder diagram are 7·85 (10), 3·21 (8), 3·89 (6). [A.M. **44**–468].

Pp. 286–288. Neckrasova (Z. A.). *Uramphite* $NH_4(UO_2)(PO_4).3H_2O$.

Data additional to those reported in M.A. **14**–277 are: easily soluble in cold 10% HCl, and in heated HNO_3; fluorescence moderate in yellow-green, destroyed by heating; pleochroism α colourless, γ pale green: X-ray constants completely similar to those of synthetic ammonium uranyl phosphate, the strongest lines being 3·78 (10), 2·22 (9), 1·694 (8–9). [A.M. **44**–464]

Pp. 289–291. Chernikov (A. A.) & Alexeyeva (M. A.). *Sodium autunite* $Na_2(UO_2)_2(PO_4)_2.8H_2O$.

Data have already been given under the name natro-autunite [Натроотэнит, M.A. **14**–277]. Dehydration data and a second set of X-ray powder spacings are given; the strongest lines are 3·20 (10), 8·54 (9), 5·36 (7), 2·91 (7) [Alexeyeva set]; 3·67 (10), 2·675 (8), 1·556 (8), 1·540 (8) [Chernikov set].

Pp. 291–293. Kopchenova (E.Y.) & Skvortsova (K.V.). *Sodium uranospinite* $(Na_2,Ca)(UO_2)_2[(As,P)O_4].5H_2O$.

Data additional to those reported in M.A. **14**–53 are:— Sometimes pleochroic, α colourless, $\beta = \gamma$ yellow; fluoresces bright yellow-green; strongest X-ray lines 8·48Å (10). 3·68 (10), 3·292 (9), 1·837 (9).

Pp. 293–294. Belova (L. N.). *Arsenuranyl* $Ca(UO_2)_4(AsO_4)_2(OH)_4.6H_2O$.

The optical data given earlier [M.A. **14**–282; A.M. **44**–208] are refined as biaxial, –ive, α 1·738, β 1·761, γ 1·77[illegible] 1·778. The strongest X-ray lines are 7·72 (10), 3·85 (1[illegible] 8·41 (8), 3·13 (8).

P. 294. Belova (L. N.). *Arsenuranocirc*[illegible] $Ba(UO_2)_2(AsO_4)_2.8H_2O$.

Specimens from a pitchblende-molybdenum depos[illegible] gave tabular plates of a pale green brightly fluoresce[illegible] mica with which small particles of metazeunerite a[illegible] barium uranophane were associated. Chem. anal. [illegible] Y. S. Nesterova and L. E. Novorossova: Ba[BaO] 12·9[illegible] As_2O_5 23·46, UO_3 50·03, H_2O 12·00, =98·48; optical[illegible] uniaxial, –ive, ω 1·632, ε 1·623. The strongest X-ray lin[illegible] are 9·82 (8), 3·68 (8), 1·461 (8). M. Fleischer [A.M. **44**–46[illegible] points out that the identity of arsenuranocircite wi[illegible] meta-heinrichite is evident, that it is not clear which nam[illegible] has priority, and that the mineral described should ha[illegible] been called meta-arsenuranocircite. [For metaceineri[illegible] in Belova's paper read metazeunerite].

P. 295. Belova (L. N.). *Barium uranophane.*

The mineral forms crusts of pyramidally terminat[illegible] crystals on pitchblende; α 1·797 (pallid yellow), β 1·81[illegible] γ 1·820 (bright yellow), $\gamma : c$ 10°–14°; fluorescence gree[illegible] yellow, a little more intense than in ordinary uranophan[illegible] Too little material available for chem. anal.; sen[illegible] quantitative spectrogr. anal. by L. N. Indichenko ga[illegible] Ba, U, Si n%, Mo, Al, Ca 0·n%, Mg, Zn 0·0n%, [illegible] 0·00n%. X-ray data similar to those for cuprosklodow[illegible] kite; strongest lines 7·93 (8), 3·99 (6), 2·14 (5), 1·997 ([illegible] [A.M. **44**–466]

Pp. 295–297. Chernikov (A. A.), Krutetskaya (O. V[illegible] & Sidelnikova (V. D.). *Calcium urcilite a*[illegible] *magnesium urcilite.*

Data additional to those given in M.A. **14**–277:– solub[illegible] in acids with separation of gelatinous silica; on heatin[illegible] water is lost and the minerals become black; bright gree[illegible] yellow fluorescence; pleochroism given here as α ligh[illegible] yellow, γ bright yellow; X-ray data are given and t[illegible] strongest lines of Ca-ursilite are 3·37 (10), 3·02 (10[illegible] 4·56 (9), 1·828 (9); of Mg-ursilite 4·98 (10), 3·06 (10[illegible] 2·30 (9), 2·07 (9). Two more analyses of ursilite a[illegible] given; SiO_2 26·90 (26·82), Al_2O_3 0·24 (—), Fe_2O_3 0·[illegible] (0·14), CaO 5·75 (6·31), MgO 0·95 (2·49), UO_3 50·[illegible] (50·40), H_2O- 8·83 (14·7), H_2O+ 6·90 (—), =100·[illegible] ('100·96'), sp. gr. 3·034 (3·054); in the analysis alread[illegible] quoted [M.A. **14**–278] MgO is now given as 1·51 [1·55[illegible] Refr. ind. are compared with those of other uran[illegible] silicates; those of gastunite agree most closely. [A.M[illegible] **44**–464]

Pp. 298–299. Chernikov (A. A.). *Hydrogen autunite.*

The natural mineral occurs as thin transparent mica-like plates, elongated [010], with cleavage {001} perfect, {100} and sometimes {010} [? equivalent] imperfect; colour pale yellow, lustre vitreous, UV fluorescence intense yellow-green, sp. gr. 3·41, uniaxial, –ive; refr. ind. when fresh ω 1·583, ε 1·569, after keeping at 30–40°C for a week ω 1·590, ε 1·576; X-ray powder data agree closely with those for synthetic hydrogen autunite [M.A. **13**–7; A.M. **40**–917]; the strongest lines are 4·99 (10), 3·54 (10), 3·26 (10).

Pp. 299–300. Polikarpova (V. A.). *Nenadkevite.*

Data additional to those quoted in M.A. **13**–385 and A.M. **42**–441 include a further analysis of a yellow variety: UO_3 59·60, UO_2 0·62, SiO_2 10·90, TR_2O_3 1·31, ThO_2 n.d., Fe_2O_3 1·80, CaO 4·80, MgO 3·77, PbO 9·80, H_2O+ 7·10, =99·70. Six photomicrographs illustrate the morphological resemblance to thorite and zircon. H. 4·69 (black) to 4·0 (yellow). Heating increases sp. gr. to 6·48 (black), 4·81 (yellow). Refr. ind. of black variety are given as 1·716–1·718 [previously reported as 1·781]. X-ray spacings for the crystalline light-coloured varieties are indexed [line 5 should be 020] and the cell-dimensions derived as a 6·77, b 6·97, c 6·45Å, β 104°43′ [cf. monazite]; strongest lines are 2·90 (10), 1·883 (6), 4·65 (4). [M.M. **32**–351]

Pp. 304–306. Kopchenova (E. V.) & Skvortsova (K. V.). *Uranium-molybdenum blacks.*

Colloform pitchblende and molybdenite aggregates are thought to have been co-precipitated from colloidal solutions. Their black or blue-black powdery oxidation products have a wide range of U and Mo contents and are termed uranium-molybdenum blacks by analogy with uranium blacks. They are amorphous to X-rays, opaque in transmitted light and dark-grey in reflected light. Spectrogr. and chem. analyses show considerable complexity of composition.

Pp. 306–307. Kopchenova (E. V.) & Skvortsova (K. V.). *Uranium-containing powellite.*

Small bipyramids of uraniferous powellite are formed by the oxidation of U-Mo blacks. They vary between brown and grey, have an adamantine lustre, sp. gr. a little >4·2, refr. ind. ⩾1·78, low birefringence, and are uniaxial (+). Microchemical analysis gave MoO_3 66·27, CaO 28·50 (some calcite impurity), UO_3 0·69, ign. loss 2·80, insol. res. 1·70, =99·96.

Pp. 307–308. Razumnaya (E. G.). Smolianskaya (G. A.), Korolev (K. G.) & Pakulpis (G. V.). *Arshinovite as a metacolloid variety of uranium-containing zircon.*

Data additional to those given in M.A. **14**–277:– sol. in dilute acids; H. low, sp. gr. variable, does not usually exceed 3·3, sometimes as low as 3·0–2·8; refr. ind. of semitransparent varieties 1·664–1·750, anisotropic varieties give a grey interference colour or, seldom, white or yellow. [A.M. **44**–210; M.A. **14**–277]

Pp. 308, 309. The paper concludes with an unsigned section [probably by Z. L. Ambartsumian] summarizing work on the thermal decomposition of hydrated uranyl minerals. [M.M. **32**–351] R. K. H., J. E. T. H.

PHYSICAL PROPERTIES OF MINERALS

Bloss (F. Donald), Shekarchi (E.), & Shell (H. R.). *Hardness of synthetic and natural micas.* Amer. Min., 1959, **44**, 33–48, 7 figs.

The hardness of synthetic fluorphlogopite and two natural muscovites as measured on (001) by the Knoop indentation method is anisotropic, possessing a bilateral symmetry with respect to (010). Substitution of B^{3+} into Al^{3+} positions of fluorphlogopite produced a softer mica, substitution of Fe^{3+} for Al; Mn for Mg produced little change. Substitution of Ba for K produced an increase of hardness of fluorphlogopite. Except for margarite, natural micas are softer than synthetic. Natural phlogopite and biotites were softer than natural muscovites. Increased softness of natural phlogopite and natural micas as compared with synthetic fluormicas is believed partly due to the greater polarizability of the OH^- as compared to the F^-.

A. C. H.

Koen (G. M.). *The attrition of uraninite.* Trans. Geol. Soc. S. Africa, 1958, **61**, 183–191, 1 pl., 3 figs. Discussions and author's replies, pp. 193–196.

Attrition experiments were performed under identical conditions on uraninite, pyrite, monazite, fluorite, and baryte, and show that uraninite is capable of resisting mechanical wear at least as successfully as monazite: it is abraded faster than pyrite but very much more slowly than fluorite and baryte. Since monazite is a common detrital mineral, it is concluded that uraninite is equally capable of surviving mechanical transport provided that its chemical stability is not affected by the prevailing conditions.

E. S. W. S.

Denning (R. M.) & Conrad (M. A.). *Directional grinding hardness of quartz by peripheral grinding.* Amer. Min., 1959, **44**, 423–428, 3 figs.

Relative grinding hardness values at 10° rotational increments on three oriented disks of quartz were measured by peripheral grinding. The disk oriented on (010) showed two-fold hardness symmetry. The hardness anisotropy of quartz is 0·11 to 0·25 compared to that of diamond (2·0), strontium titanate (0·70), and silicon (0·26).

[Note of error : in the third line from the end on p. 428 references (1) and (2) should be reversed.] B. H. B.

Aerts (E.), Amelincks (S.), & Dekeyser (W.). *The surface hardening of X-irradiated NaCl.* Acta Metallurgica, 1959, **7**, 29–42, 20 figs.

The commonly known phenomenon of surface hardening of X-irradiated NaCl was studied as a function of both irradiation time and depth. The optical absorption of the same crystals was also studied to determine whether any correlation exists between hardness and colour centre concentration. The observations are explained by assuming the increase in surface hardness to be the result of the formation of agglomerates of point defects or 'colloidals'. A correlation was found between hardness and colour centre concentration. R. G. Wls.

Mursky (G. A.) & Thompson (R. M.). *A specific gravity index for minerals.* Canad. Min., 1958, **6**, 273–287.

A valuable compilation of the specific gravities of over 1400 minerals listed in increasing order, including all those published to September 1957, and a number of new determinations made by the authors. The last similar complete list is that of Spencer [M.M. **21**–337]. R. B. F.

Hughes (D. S.) & McQueen (R. G.). *Density of basic rocks at very high pressures.* Trans. Amer. Geophys. Union, 1958, **39**, 959–965, 8 figs.

Theory and practice of shock wave experiments which permit the development of pressures up to a million bars are described. V/V_0 is about 0·66 for a dunite at 720,000 bars. V/V_0 is about 0·60 for two gabbros at 750,000 bars. Data for one of the gabbros indicate a volume discontinuity of the order of 10% at about 150,000 bars. F. R. B.

Mayer (W. G.) & Hiedemann (E. A.). *Ultrasonic determination of elastic constants and structural irregularities in transparent single crystals.* (*Measurements in sapphire.*) Acta Cryst., 1959, **12**, 1–6, 5 figs. [M.A. **11**–153] J. Z.

Joel (N.) & Wooster (W. A.). *Theories of crystal elasticity.* Nature, 1957, **180**, 430–431.

The origin of volume couples is illustrated by the description of a working model of hexagonal Se. The applicability of the new theory to the eleven enantiomorphous classes a[illegible] classes *m*, *mm*, $\bar{4}$, $\bar{4}2m$ has been tested experimentally [illegible] quartz and $(NH_4)H_2PO_4$. D. McK.

Sabatier (G.). *Recherches sur la déformation sous charge[illegible] haute température de quelques roches éruptives.* Bu[illegible] Soc. franç. Min. Crist., 1959, **82**, 3–11, 12 figs.

A method is described for the determination at hi[illegible] temperatures of the viscosities of rocks above 10^7 pois[illegible] Results are given for glassy rhyolites between 800° a[illegible] 1100°C and for various volcanic rocks partially melted at t[illegible] experimental temperatures of 1000° to 1150°C. Ne[illegible] chemical analyses are given for obsidian (2), retinite, basa[illegible] trachyte, and phonolite. R. A. H.

Takeuchi (T.), Sugaki (A.), Tashiro (C.), & Yamawa[illegible] (T.). *On the specific heat of some ore-forming minera[illegible] (Thermodynamic studies of ore genesis, first report).* S[illegible] Rept. Tohoku Univ., ser. 3, 1959, **6**, 311–322, 6 figs.

Specific heat–temperature curves in the range –180° to 400°C were obtained for pyrite, chalcopyrite, pyrrhotin[illegible] and hematite. Pyrite and chalcopyrite showed no anomalie[illegible] but pyrrhotine showed anomalous changes in the specif[illegible] heat due to phase transformations at 220°C and 320°C an[illegible] hematite showed a similar effect at –40°C. The latent he[illegible] of inversion of vein quartz was 2·6 to 4·5 cal/g. R. A. H.

Farmer (V. C.). *The infra-red spectra of talc, saponite a[illegible] hectorite.* Min. Mag., 1958, **31**, 829–845, 7 figs.

Infra-red absorption spectra in the range 4000–400 cm[illegible] have been obtained for oriented specimens of talc, saponit[illegible] and hectorite. Vibrations perpendicular to the structura[illegible] sheets of the minerals were identified and the results com[illegible] pared with theoretical predictions. The magnesium silicat[illegible] absorption bands are broader for the smectites than for tal[illegible] because of the isomorphous substitutions within the layer[illegible] Interlayer water in the smectites gives rise to three absorp[illegible] tion bands one of which corresponds to a very weak hydroge[illegible] bond. Spectral changes which occur after vigorous grindin[illegible] of specimens are consistent with small particle size or wit[illegible] numerous dislocations in the structure of larger particle[illegible] perpendicular to the plane of the sheets. [M.M. **31**–672[illegible] M.A. **11**–449] J. Z.

Brindley (G. W.) & Zussman (J.). *Infra-red absorptio[illegible] data for serpentine minerals.* Amer. Min., 1959, **44**[illegible] 185–188, 1 fig.

Infra-red spectra were determined on chrysotile[illegible] lizardite, 6-layer orthoserpentine, and antigorite. Stron[illegible] absorption bands were found to be present at 2·75, 6·25[illegible] 9·30, 10·15 and 10·50 μ. Data presented may serve t[illegible] distinguish antigorite from other serpentine minerals. A. C. H.

YCKAERTS (G.). *The infra-red analysis of solid substances : a review.* Analyst, 1959, **84**, 201–214, 15 figs.

In a discussion of the physical and chemical factors ecting infra-red spectra the influence of the dimensions the individual absorbing particles on the intensity of the sorption bands is illustrated by reference to the absorption nds of calcite at 876 and 710 cm^{-1}. R. A. H.

ETKINA (O. N.)] Сеткина (О. Н.). Инфракрасные спектры минералов и их практическое применение. [*Infra-red spectra of minerals and their practical use.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Miner. Soc.] 1959, **88**(1), 39–47, 4 figs.

This is a brief discussion of the theory of infra-red spectra applied to minerals, of the data relating to the spectra certain silicate minerals and of certain methods employed this work. S. I. T.

PPESEN (M. A.) & PAYNE (RICHARD E.). *The dispersion and the temperature coefficient of the birefringence of selenite.* Amer. Min., 1959, **44**, 193–196, 3 figs.

The birefringence ($N\gamma$–$N\alpha$) for selenite at 25° and 85°C given. The mean value of the temperature coefficient of refringence in the range 3600–8200 Å and temperatures of ° and 85°C is $-1{\cdot}00\times10^{-5}$/°C$\pm$8%. A. C. H.

ANDARINO (JOSEPH A.). *Absorption and pleochroism : two much-neglected optical properties of crystals.* Amer. Min. 1959, **44**, 65–77, 3 figs.

Absorption and pleochroism terminology, theory, equaons, and common fundamental relationships are presented. s absorption constant, the absorption coefficient (k) is eferred. The quantitative expression for pleochroism as absorption is re-emphasized. The author proposes that $k\alpha$, $k\beta$, and $k\gamma$ refer to the absorption associated with the rections of the refractive indices α, β, and γ. Methods for ıe measurement of absorption and pleochroism are given. A. C. H.

EPPESEN (M. A.). *Some optical, thermo-optical, and piezo-optical properties of synthetic sapphire.* Journ. Opt. Soc. America, 1958, **48**, 629–632, 2 figs.

Measurements of ω and ε for synthetic sapphire are eported for various wavelengths from 6907 to 2536 Å : for 4°C and λ 5893 the values obtained were ω 1·76808, 1·75999. The temperature coefficients were determined or the refractive indices and birefringence, and the piezo-ptical coefficient for the birefringence was also obtained. hese data were used to yield order of magnitude values for he thermal coefficient of expansion and Young's modulus. R. A. H.

KENNEDY (G. C.), KNIGHT (W. L.), & HOLSER (W. T.). *Properties of water. Part III. Specific volume of liquid water to* 100°*C and* 1400 *bars.* Amer. Journ. Sci., 1958, **256**, 590–595, 2 figs.

Accepting the data of Tilton and Taylor (1937) and Owen, White, and Smith (1956) on the specific volume of water at one bar pressure in the temperature range 0–100°C, the relative changes of specific volume as a function of pressure were determined at intervals of 10°C and 100 bars pressure and are presented in a table. In much of the range of temperature and pressure covered the results agree more closely with those of Amagat (1893) than with those of later investigators. J. T. L.

HOLSER (WILLIAM T.) & KENNEDY (GEORGE C.). *Properties of water. Part IV. Pressure-volume-temperature relations of water in the range* 100–400°*C and* 100–1400 *bars.* Amer. Journ. Sci., 1958, **256**, 744–753.

On the basis of precise, new and old data, the specific volume of H_2O is tabulated for the pressures 100(50)-500(100)1400 bars [i.e., from 100 by steps of 50 to 500, etc.] and temperatures 120(20)400°C, ranging from 0·9982 cc/g at 1400 bars and 120°C, to 26·41 cc/g at 100 bars and 400°C. [See preceding abstract and op. cit., 1957, **255**, 724–730] H. W.

HOLSER (W. T.) & KENNEDY (GEORGE C.). *Properties of water. Part V. Pressure-volume-temperature relations of water in the range* 400–1000°*C and* 100–1400 *bars.* Amer. Journ. Sci., 1959, **257**, 71–77.

Continuation [two preceding abstracts] giving specific volumes of water for pressures in the range of 150(50)-500(100)1400 bars and temperatures 420(20)700°C, thus extending the temperature range previously reported. According to the new table, the specific volume of H_2O is 1·398 cc/g at 420°C and 1400 bars, and 38·74 cc/g at 1000°C and 150 bars, and correspondingly intermediate under intermediate conditions. H. W.

ECKART (CARL). *The equation of state of water and sea water at low temperatures and pressures.* Amer. Journ. Sci., 1958, **256**, 225–240, 9 figs.

An empirical equation of state, $(p+p_0)(\Delta-\beta) = \lambda$, is used to correlate the p–v–T data for pure liquid water of Amagat (1890), Ekman (1908), Bridgman (1913), and Kennedy, Knight, and Holser [see abstract three above]. $\Delta = 10^4(1-v)$ where v is the specific volume in cc/g, p is the pressure in atmospheres, and p_0, β, and λ are constants for a given temperature. In the range 0–40°C and 0–1000 atm. the precision of the specific volume data is not better than $\pm$0·0002 cc/g, and can be adequately fitted by least squares to the equation, with $\beta = 3020$ at any T and $p_0 = 5890 + 38T$

$-0{\cdot}375T^2$, where T is °C. The equation can also be used to represent the higher pressure data of Bridgman up to 3000 bars. The single set of data on sea water by Ekman (1908) can be fitted to a similar equation with the same β and $p_0 = 5890 + 38T - 0{\cdot}375T^2 + 3S$, where S is the salinity. The precision here is not less than that for pure water, and conventional oceanographic calculations should be modified accordingly. W. T. H.

Logie (H. J.) & Urlau (R. R.). *Some electronic properties of diamonds.* S. Afr. Journ. Sci., 1959, **55**, 19–25, 5 figs.

A study has been made of diamond as a counter for β_1 particles. The source was ^{90}Sr and a field strength of 10^4 volts cm^{-1} was applied. Under these conditions a typical counting rate was 100 pulses sec^{-1}. With no illumination, the counting rate decreases with time until a steady state is reached. A systematic survey was made of the change in counting rate when the crystal was illuminated by light of $\lambda\lambda$ 3940, 4470, 5720, 6250, 7080Å and infra-red radiation. For λ 6250Å and longer wavelengths, the counting rate is enhanced with shorter wavelengths, a brief enhancement followed by a rapid fall in the counting rate takes place. These effects are considered to be due to the presence of two impurities, one (acting as donor) having an energy level 2·1 eV below the conduction band and the second (acting as an acceptor) having an energy level 1·6 eV above the valence energy band. S. R. T.

Kiriyama (R.) & Kawai (S.). *Dielectric phenomena of low quartz.* Journ. Min. Soc. Japan, 1958, **3**, 609–625, 9 figs. (in Japanese : English summary, ibid., 799–800).

Temperature and frequency dependencies of the dielectric constant and loss of a transparent crystal of Brazilian quartz were measured parallel and perpendicular to *c* from −70° to 600°C and in the frequency range 0·3 kc to 3 Mc. The enthalpy of activation for the dielectric relaxation was 21·3 kcal/mole, and the activation energy for d.c. conduction 17·84 kcal/mole. Infra-red absorption spectra showed marked dichroism near the O–H stretching vibration. It is considered that water molecules or OH ions and Na ions are trapped in structure defects. The behaviour of such ions under rising temperature and an applied electric field is discussed. R. A. H.

[Yagn (N. I.) & Sokolova (V. G.)] Ягн (Н. И.) и Соколова (В. Г.) Определение электрохимической растворимости молибденита в водных растворах. [*Determination of electrochemical solubility of molybdenite in water solutions.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.] 1959, **88**(1), 72–80, 7 figs.

The results of experiments determining the solubility of MoS in dilute acid and alkaline hydrous solutions un conditions of a constant electric current are given. S. I. T

Barton (Vola P.) & Lindsay (George A.). *Reflection X-rays from the* (100) *face of fluorite.* Acta Cryst., 19 **11**, 848–851, 1 fig.

The reflecting power of fluorite in the 200 reflection fr the (100) face is much greater in the region 1300–3000 X [1 X.u. = $\frac{1}{1000}$kX] than has been reported for shor wavelengths. J. Z

Roche (Alexandre). *Sur l'aimantation des roches vol niques de l'Esterel.* C.R. Acad. Sci. Paris, 1957, **2** 2952–2954.

Observation of the directions of magnetization sho different values. For andesites and dolerites of Permi age the magnetic inclination is very low and the directi of magnetization is reverse. For esterellite, the age which is uncertain, magnetization is normal in direction a has inclination analogous to that usual in Tertiary a Quaternary rocks. [Author's abstract] E. J.

Runcorn (S. K.). *Rock magnetism.* Nature, 1957, **179**, 8 C. H. K.

Kroon (D. J.) & Stolpe (C. v. d.). *Positions of protons aluminium hydroxides derived from proton magne resonance.* Nature, 1959, **183**, 944–945, 2 figs.

Observed and calculated second moments of the absor tion line agree for hydrargillite and boehmite but dif greatly for bayerite. C. H. K.

Chevallier (R.) & Mathieu (S.). *Susceptibilité magnétiq spécifique de pyroxènes monocliniques.* Bull. Soc. Chi France, 1958, 726–729.

—— & Martin (R.). *Le moment magnétique de l'i ferreux dans une série de pyroxènes monocliniqu* Ibid., 1959, 9–10, 2 figs.

The magnetic properties of a series of clinopyroxen from the Skaergaard intrusion, east Greenland, have be measured. The magnetic susceptibility follows the relatio ship $\sigma = \sigma_0 + \psi H$ where σ_0 is due to the ferromagnetic impuri (10^{-3} to 10^{-4}% magnetite) and ψ is the specific magnet susceptibility of the pyroxene. Chemical analyses sh that the only magnetic ions present are Fe^{2+}, Fe^{3+}, Mn^{2+} the susceptibilities of these pyroxenes at 20°C are calculat and are in satisfactory agreement with the observed valu Magnetic measurements at 90°K lead to a value of t magnetic moment for Fe^{2+} of $P_B = 5{\cdot}20 \pm 0{\cdot}14$ Bohr ma netons, with a positive temperature Θ of up to 36°

our new analyses of clinopyroxenes by E. A. Vincent are bulated, in addition to ten previously published [M.M. –511]:

G. No.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	Total
0264	49·54	0·05	1·13	2·08	25·08	0·52	2·92	18·21	0·43	0·05	'100·09'
3021	48·74	0·12	1·15	1·89	26·16	0·70	1·80	18·93	0·44	0·05	99·98
4332	47·52	0·12	1·79	2·20	27·43	0·65	1·18	18·76	0·34	0·04	100·03
4489	46·90	0·10	2·20	1·66	29·10	0·67	0·58	18·87	0·32	0·04	100·44

R. A. H.

ARMICHAEL (C. M.). *Remanent magnetism of the Allard Lake ilmenites.* Nature, 1959, **183**, 1239–1241, 1 fig.

C. H. K.

RAHAM (J. W.), BUDDINGTON (A. F.), & BALSLEY (J. R.). *Magnetostriction and palaeomagnetism of igneous rocks.* Nature, 1959, **183**, 1318. C. H. K.

COX (A.). *Remanent magnetism of lower to middle Eocene basalt flows from Oregon.* Nature, 1957, **179**, 685–686, 4 figs. C. H. K.

NAIRN (A. E. M.), FROST (D. V.), & LIGHT (B. G.). *Palaeomagnetism of certain rocks from Newfoundland.* Nature, 1959, **183**, 596–7, 1 fig.

M. J. Le B.

CHANG (WEN-YOU) & NAIRN (A. E. M.). *Some palaeomagnetic investigations on Chinese rocks.* Nature, 1959, **183**, 254, 1 fig.

M. J. Le B.

ROCHE (A.) & CATTALA (L.). *Remanent magnetism of the Cretaceous basalts of Madagascar.* Nature, 1959, **183**, 1049–50, 1 fig.

M. J. Le B.

ROCK-FORMING MINERALS AND PETROLOGY

Rock-forming minerals

RASIMA (Y.). *Cristobalite from the Abuta mine in Hokkaido, Japan.* Journ. Min. Soc. Japan, 1958, **3**, 738–746, 2 figs., 1 pl. (in Japanese ; English summary, ibid., 806).

Opal and low-temperature cristobalite occur in the tuff nd agglomerate of the wall rocks of native sulphur and ulphide ore deposits and in disseminated goethite ore. K-ray diffraction data and electronmicrographs are given or the hexagonal platy cristobalite. R. A. H.

TARKEY (J.). *Chess-board albite from New Brunswick, Canada.* Geol. Mag., 1959, **96**, 141–145, 1 pl.

The occurrence of chess-board albite in regionally metaorphosed porphyries from Northumberland County, New Brunswick, is described. With increasing metamorphism riginal phenocrysts of perthite are changed into chessoard albite, particularly in parts of the crystals which ppear to have been stressed. The formation of chessoard albite is ascribed to soda metasomatism of a potassium eldspar followed or accompanied by deformation. This heory is consistent with described British occurrences.

M. G. B.

SADRAN (G.). *Les plagioclases synthétiques et le problème des hautes et basses températures.* Bull. Soc. franç. Min. Crist., 1959, **82**, 166–170, 4 figs.

Optical study of plagioclases in two synthetic products shows that high-temperature forms occur in specimens with glassy texture while low-temperature plagioclase occurs in crystalline material, although both forms have been obtained at the same temperature. R. A. H.

DONNAY (GABRIELLE), SCHAIRER (J. F.), & DONNAY (J. D. H.). *Nepheline solid solutions.* Min. Mag., 1959, **32**, 93–109, 4 figs.

The general formula for nepheline may be written as $K_xNa_yCa_z\square_{8-(x+y+z)}Al_{(x+y+2z)}Si_{16-(x+y+2z)}O_{32}$ where the symbol □ stands for vacant cation sites. X-ray data for pure sodium nepheline synthesized under different conditions of temperature and time show that the cell dimensions do not vary from a 9·986Å and c 8·330Å, both ±·005Å : one sample however gave values of a 9·971 and c 8·362Å and has been described as a high-temperature form [not the same as the high-temperature form of nepheline described by Smith and Tuttle, M.A. **14**–54]. The cell dimensions of nephelines change with composition in the systems $NaAlSiO_4$–$CaAl_2O_4$ and $NaAlSiO_4$–$KAlSiO_4$, but do not change in the systems $NaAlSiO_4$–$NaAlSi_3O_8$ and $NaAlSiO_4$–$CaAl_2Si_2O_8$. The substitution CaAl for NaSi does not occur in natural nephelines so it is concluded that a good estimate of chemical composition of a natural nepheline can be obtained from the cell volume. [M.M. **30**–439] W. S. M.

CROWDER (DWIGHT F.). *Granitization, migmatization, and fusion in the Northern Entiat Mountains, Washington.* Bull. Geol. Soc. America, 1959, **70**, 827–878, 11 figs., 7 pls.

A tabular quartz diorite in the Entiat Mountains of Northern Washington consisting of quartz diorite gneiss, migmatite, leucocratic quartz diorite, and massive quartz diorite, and the country rocks, biotite gneiss and hornblende schist, are described in detail. Biotite gneiss and hornblende schist subjected to very intense metamorphism

along a narrow zone were transformed to hornblende- and biotite-quartz diorite gneisses, with change to a more igneous-like texture but little or no chemical or mineralogical change. In the centre of this zone the gneiss recrystallized to a massive quartz diorite gneiss, and locally melted to form a magma which moved and differentiated slightly. Migmatites and leucocratic quartz diorite occur both in the complex and in the country rock; they are interpreted as metamorphic differentiates. Eight gravimetric and spectrographic analyses of composite samples of the rocks, accompanied by measured and calculated modes, are presented. Analyses of biotite, gravimetric by B. Brunn and spectrographic by K. V. Hazel, are given; (A) biotite from garnet-biotite gneiss, sp.gr. 3·04, α 1·587, $\beta = \gamma$ 1·641, (B) biotite from biotite-quartz diorite gneiss, sp. gr. 3·01, α 1·589, $\beta = \gamma$ 1·635; SiO_2 35·49, 35·48, Al_2O_3 20·88, 18·15, Fe_2O_3 1·49, 3·71, FeO 17·72, 16·39, MgO 9·33, 9·72, CaO 0·12, 0·76, Na_2O 0·30, 0·32, K_2O 8·85, 7·68, H_2O+ 2·91, 4·33, H_2O- 1·07, 0·42, TiO_2 0·59, 2·25, P_2O_5 0·06, <0·01, MnO 0·45, 0·20, F 1·32, 0·97, =100·58−0·55 for F=100·03, 100·38−0·41 for F=99·97, for (A) and (B) respectively. A. L. A.

Tomiska (T.). *On the chemical properties, optical properties and the structural types of some muscovites and phlogopites (Studies in the mica group, Rept. 1).* Journ. Min. Soc. Japan, 1958, **3**, 710–721, 3 figs. (In Japanese; English summary, ibid., 804–805).

Chemical analyses are given for a hydrous muscovite (A) from a vein in serpentinite rock from Maruo, Ube City, Yamaguchi Prefecture (mean of two analyses by T. Kurisu and T. Tomisaka), and for a phlogopite (B) from a cavity in basalt from Mutsure Island, Yamaguchi Prefecture, Japan (analyst T. Tomisaka). X-ray powder data and d.t.a. curves are given for both minerals and for a muscovite, from a 'Roseki' deposit embedded in liparite from the Uku mine, Yamaguchi Prefecture, which had α 1·567, β 1·602, γ 1·607, $2V_\alpha$ 42°, $b = \gamma$; structure type $2M_1$, a 5·18, b 9·00, c 20·18Å, β 95°20′.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	Na_2O	K_2O	H_2O+	H_2O-	Total
A	42·83	40·13	1·34	0·14	0·58	0·90	7·29	6·36	0·77	100·70
B	40·88	10·29	3·16	7·45	19·75	2·21	8·81	3·02	1·01	100·48

	α	β	γ	$2V_\alpha$	Type	a(Å)	b(Å)	c(Å)	β
A	1·566	1·603	1·608	38°	$2M_1$	5·19	8·99	20·09	95°31
B	1·559	—	1·607	24°	3M	5·30	9·24	30·56	90°30′

Totals include TiO_2 0·14, 3·63, MnO nil, 0·09, CaO 0·22, 0·18 for A and B respectively. R. A. H.

Hurst (Vernon J.). *Polymorphism of micas in the Mineral Bluff and Epworth quadrangles, Georgia.* Bull. Geol. Soc. America, 1957, **68**, 1581–1584, 2 figs.

The mica polymorphs of 97 mica-bearing samples, including rocks from the biotite, garnet, and staurolite metamorphic zones, were determined by X-ray diffracti techniques. The muscovite micas all have $2M_1$ structu and the biotite micas have either 1M or 3T structure. map shows sources of the samples, the metamorphic zon in which they occur, and the associated micaceous minera including paragonite. A. L. A.

Smith (J. V.). *Graphical representation of amphibo compositions.* Amer. Min., 1959, **44**, 437–440, 1 fig.

A geometrical solid model has been derived and modifi from the work of others to express the composition of t complex series of amphiboles. Limiting planes on this so are deduced from crystal chemical requirements. T following seven minerals form apices of the model: tremolit tschermakite, edenite, pargasite, richterite, eckermannit and glaucophane. B. H. B.

Yen (T. P.). *Soda-amphibole-quartz schist from Taiwa* Proc. Geol. Soc. China [Formosa], 1959, no. 2 (f 1958), 153–156, 2 figs.

Boulders of an alkali-amphibole quartz-schist contain addition epidote, muscovite, plagioclase (albite-oligoclase chlorite, with rare garnet, sphene, and iron ores. T amphibole occurs in long prisms, perfect {110} cleavage 124°, O.A.P. ‖ (010), $b = \beta$, elongation positive; dispersi weak, usually $r > v$, $2V\alpha$ 44°–80°, $\gamma : c$ 13°–23°, γ 1·65 1·671 (commonly 1·653); pleochroism commonly α lig yellow to colourless, β brownish green, γ deep greenish bl to blue. It is believed to belong to riebeckite-glaucopha group. R. A. H.

Greenwood (Robert) & Lynch (Vance M.). *Geology a gravimetry of the Mustang Hill laccolith, Uval County, Texas.* Bull. Geol. Soc. America, 1959, **7** 807–826, 9 figs.

The Mustang Hill laccolith, 1½ miles in diameter, is o of 90 small intrusions in Cretaceous sediments parallel t the Balcones fault zone of central Texas. It is analciti basalt with 27% olivine and contains diopsidic clin pyroxene but no orthopyroxene or pigeonite. A measure and a calculated mode are given for one chemically analyse rock. The composition of the clinopyroxene is: SiO_2 49·2 Al_2O_3 4·61, Fe_2O_3 0·68, FeO 6·00, MgO 14·18, CaO 22·0 Na_2O 0·55, K_2O 0·04, H_2O+ 0·20, H_2O- 0·00, TiO_2 2·0 Cr_2O_3 0·40, MnO 0·10, =100·11; α 1·689, β 1·699, γ 1·72 $2V_\gamma$ 55°, $\gamma : c$ 46°. The field relations and the inte pretation of a gravity survey, which are presented, indicat that the intrusion is a laccolith. A. L. A.

Muir (I. D.) & Tilley (C. E.). *The compositions of co existing pyroxenes in metamorphic assemblages.* Geo Mag., 1958, **95**, 403–408, 1 fig.

Chemical analyses, by J. H. Scoon, of the coexisting ho- and clino-pyroxenes in five metamorphic assemblages licate that the tie-line trend for such pyroxene pairs is not nificantly different from that recorded for plutonic neous rocks. The specimens were an olivine hypersthene roxenite and a hypersthene diopside plagioclase gneiss, th from Scourie, Sutherland, a metamorphosed picrite salt ejected block from Kilauea, a hypersthene diopside agioclase hornfels, Aarvold Quarry, Oslo district, Norway, d an olivine-bearing pyroxene granulite from Eilean rroch, Ardnamurchan, Scotland. Compositions of the me pyroxenes deduced from optical data had previously l the authors to a different conclusion [M.A. **14**–146], and e inadequacy of the use of optical properties to determine curately the composition of augite is stressed. Three out five coexisting olivine-orthopyroxene pairs show the ivine enriched in magnesia with respect to the ortho-roxene, which is not the equilibrium condition.

M. G. B.

AGI (K.). *Synthetic pyroxenes of the acmite-diopside system.* Journ. Min. Soc. Japan, 1958, **3**, 763–769, 1 fig. (in Japanese ; English summary, ibid., 807).

A series of acmite-diopside pyroxenes have been synthe-zed by sintering the glasses of the corresponding com-positions : they show a complete solid solution relationship. heir refractive indices, optic axial angles and extinction ngles are tabulated and a new diagram is presented lating these properties and the chemical composition. ther synthetic [M.A. **10**–406] and natural alkali-pyroxenes lso are plotted and show that the diagram is of value for eterminative purposes. The cell parameters a, b, and β ecrease with increasing amounts of the acmite molecule, hile c remains approximately constant. R. A. H.

VYLLIE (P. J.). *Discrepancies between optic axial angles of olivines measured over different bisectrices.* Amer. Min., 1959, **44**, 49–64, 5 figs.

Measurements of 2V were made on forsteritic olivines rom two picrite sills in Soay, Scotland, using double and ingle axis conoscopic methods. A significant difference vas found to exist between the means of double axis neasurements made over different bisectrices. Measure-nents of $(-)2V_\alpha$ are smaller than $(-)2V_\gamma$ by about 2·5° ; he difference is explained if recorded angles are smaller han true angles when large angles are measured by niversal stage. Calculations show that refraction and lisplacement of light within the central layers of the sphere ould produce this effect. Optical measurements of 2V near 0° should be corrected when made at high angles of tilt.

A. C. H.

HECKROODT (R. O.). *An X-ray method for the determination of olivine.* Trans. Geol. Soc. S. Africa, 1958, **61**, 377–386, 3 figs.

For powder diffraction cameras of small radius, correlation between the positions of the 0 10 0 and 2 2 6 reflections and the composition of an olivine sample is shown to be within 2 mol. per cent. [M.A. **14**–137, 146] E. S. W. S.

NICKEL (E. H.). *The composition and microtexture of an ulvöspinel-magnetite intergrowth.* Canad. Min., 1958, **6**, 191–199, 5 figs.

The magnetic fraction of titaniferous iron ore from Rouville County, Quebec, was shown by chemical analysis, X-ray diffraction, and electron microscopy to consist of relatively large pleonaste laths embedded in a groundmass of magnetite cubes in ulvöspinel [M.A. **10**–5, 101, **12**–388]. The ulvöspinel has a 8·460Å, and its composition is deduced as $(Mg_{0\cdot42}Fe_{0\cdot58})(Fe_{1\cdot03}Ti_{0\cdot71}Al_{0\cdot26})O_{3\cdot90}$. The intergrowth of the three minerals is presumed to result from exsolution.

R. B. F.

HASEGAWA (S.). *Chemical studies of allanites from the new localities in Fukushima and Kagawa Prefectures.* Sci. Rept. Tohoku Univ., Ser. 3, 1958, **6**, 39–56, 7 figs., 1 pl.

Six new pegmatite localities for allanite are described from Japan. Chemical analyses by S. Hasegawa are given for allanite (A) from Tomita village near Kawamata, Fukushima Prefecture, with strong pleochroism α' pale greenish yellow, γ' yellowish brown ; allanite (B) from Takano Village, north of Miharu Town, Fukushima Prefecture ; allanite (C) from Magaki, north of Ishikawa Town, Fukushima Prefecture, with O.A.P. normal to b and distinct (001) cleavage ; allanite (D) from Horikiri, Kamosho Village, Kagawa Prefecture ; and allanite (E) from Kanayama, Murei Village, Kagawa Prefecture. A pegmatite at Shiozawa, near Ishikawa Town, Fukushima Prefecture, has yielded manganoan allanite (F) with O.A.P. normal to b, $\alpha : c = 20°$, $\beta = b$; $2V_\alpha$ 63–69°, distinct pleochroism α pale greenish brown, γ brown ; it is associated with quartz, plagioclase, fergusonite, zircon, xenotime, and spessartine garnet ; the analysis of the latter gave SiO_2 36·24, TiO_2 0·26, Al_2O_3 20·28, Fe_2O_3 2·30, FeO 21·00, MnO 18·79, MgO 0·24, CaO 1·08, H_2O+ 0·18, H_2O- 0·13, =100·50, D_4^{20} $4{\cdot}24_3$ gm/cc. The methods of chemical analysis for allanite are discussed and the analyses are compared with those for allanite from elsewhere.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	ThO_2	Ce_2O_3
A	30·34	0·54	16·38	4·26	9·90	1·90	1·65	9·93
B	30·82	0·44	16·03	3·23	10·90	1·45	1·89	9·39
C	30·93	0·35	17·32	2·85	11·55	2·53	2·10	8·30
D	30·53	0·23	17·23	4·00	10·60	1·38	1·32	6·82
E	30·87	0·05	16·84	2·83	12·61	2·78	2·04	6·91
F	30·78	0·26	15·44	3·48	10·95	6·52	2·04	8·72

	$[La]_2O_3$	$[Y]_2O_3$	MgO	CaO	H_2O+	H_2O-	Total	Sp. gr.
A	10·97	2·96	0·09	8·08	2·08	0·41	99·69	3·882
B	12·53	1·76	0·12	8·59	1·87	0·44	99·46	3·829
C	10·25	2·85	0·08	8·40	1·83	0·26	99·60	3·835
D	10·58	5·19	0·12	8·14	2·73	0·38	99·25	3·820
E	11·47	4·42	0·21	7·35	1·71	0·21	100·30	3·857
F	11·63	2·98	0·07	4·90	1·80	0·26	99·83	3·910

A also includes BeO 0·12, SnO_2 0·08.

[M.A. **14**–148] R. A. H.

Hasegawa (S.). *Allanites from the pegmatites of several localities in southwestern Japan.* Sci. Rept. Tohoku Univ., Ser. 3, 1959, **6**, 209–226, 10 figs.

Allanite (A) from a pegmatite at Shimotawara, Osaka Prefecture, has pleochroism α' pale greenish yellow, γ' greenish brown; allanite (B) from Kanayama, Kagawa Prefecture, is associated with oligoclase and brownish red almandine-spessartine garnet (E); allanite (C) from the small island of Ikinashima in the Seto Inland Sea, Ehime Prefecture, is embedded in pink perthite; allanite (D) from Tateiwa Mine, Ehime Prefecture, occurs with feldspars, thorogummite, zircon, and lepidomelane. All analyses are by S. Hasegawa and also include 4 of the co-existing perthites and 1 of oligoclase.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	ThO_2	Ce_2O_3
A	30·52	0·16	16·35	3·85	11·05	1·52	2·14	5·97
B	31·02	0·06	17·07	4·23	10·34	0·82	1·98	7·88
C	29·73	0·26	15·68	5·38	12·03	2·13	1·31	7·45
D	30·27	0·14	16·23	3·82	11·53	3·10	1·43	8·05
E	35·96	0·19	20·72	3·06	22·63	15·46	—	—

	$[La]_2O_3$	$[Y]_2O_3$	MgO	CaO	H_2O+	H_2O-	Total	Sp. gr.
A	10·11	6·53	0·11	8·73	1·93	0·42	99·39	3·800
B	11·53	2·42	0·23	10·08	1·78	0·29	99·73	3·762
C	10·23	3·92	0·22	8·76	2·02	0·42	99·54	3·881
D	11·74	3·58	0·16	7·28	1·88	0·32	99·53	2·900
E	—	—	0·38	1·23	0·28	0·32	100·23	—

[M.A. **12**–279, **14**–148, and preceding abstr.] R. A. H.

Ueda (Tateo). *The crystal structure of allanite, $OH(Ca, Ce)_2(Fe^{III},Fe^{II})Al_2OSi_2O_7SiO_4$.* Mem. Coll. Sci., Univ. Kyoto, Ser. B, 1955, **22**, 145–163, 5 figs.

Allanite from biotite granite at Daimonji-yama, Kyoto Prefecture, Japan, has a 8·98, b 5·75, c 10·23Å, β 115°00′, $Z=2$, sp.gr. 3·85. Its chemical analysis gave SiO_2 30·54, TiO_2 1·10, Al_2O_3 17·48, Fe_2O_3 4·19, FeO 9·22, MnO 0·58, MgO 0·85, CaO 11·00, ThO_2 1·27, Ce_2O_3 9·94, $[Ce]_2O_3$ 10·55, $[Y]_2O_3$ 0·63, SnO_2 0·41, H_2O+ 1·59, H_2O- 0·88, =100·23, leading to the formula $H(Ca,Ce)_2(Fe^{3+},Fe^{2+})Al_2Si_3O_{13}$. The structure is similar to that of epidote [M.A. **12**–336] and contains both SiO_4 and Si_2O_7 groups, joined to one another by Al, (Fe^{3+},Fe^{2+}), and (Ca,Ce) atoms on the one hand and by O and OH on the other. The framework of the structure is composed of AlO_4 and $AlO_3(OH)$ chains parallel to the b-axis. R. A. H.

Murthy (M. V. N.). *On the crystallization of accessory zircon in granite rocks of magmatic origin.* Canad. Min. 1958, **6**, 260–263.

From crystallochemical considerations the author c[on]cludes that zircon crystallizes early and rapidly in magma[tic] granites. R. B. F[ield]

Herriot (A.). *Notes on an occurrence of garnet in the fel[site] of Tinto, Lanarkshire.* Trans. Geol. Soc. Glasg[ow] 1956, **22**, 94–99.

The occurrence of garnet in the northern part of t[he] felsite laccolith of Tinto and a microchemical/spect[ro]graphic analysis of the garnet (74% almandine, 21 grossular) are recorded. The occurrence is restricted to t[he] felsite immediately surrounding a mass of plagiophy[re] lying within the laccolith, but no evidence for the formati[on] of the garnet through reaction of the plagiophyre with t[he] felsite magma has been obtained. In a loose block plagiophyre a single crystal of garnet was discerned; garnetiferous plagiophyre was found *in situ.* G. P. B.

Cano (R.) & Chatelain (P.). *Sur les produits de déshydr[ata]tion du gypse.* Bull. Soc. franç. Min. Crist., 1958, [81] 10–11.

X-ray studies show that there are only three distin[ct] crystallographic forms of calcium sulphate; gypsu[m] soluble anhydrite, and insoluble anhydrite. Solub[le] anhydrite carries zeolitic water which may vary in amou[nt] from 0·04 to 1·0 molecules H_2O per molecule of CaS[O4] without any essential structural change. The hem[i]hydrate in particular corresponds to a special configurati[on] of the zeolitic water, but is not recognised as a distin[ct] compound. [M.A. **6**–58, **8**–137] J. Z.

Petrography

Dawson (K. R.). *An application of multivariate varian[ce] analysis to mineralogical variation, Preissac-Lacor[ne] batholith, Abitibi County, Quebec.* Canad. Min., 195[8] **6**, 222–233, 5 figs.

Seventy-eight specimens of the quartz monzonite fro[m] this batholith were thin sectioned, and modal analyses ma[de] using the point count technique. The constituent minera[ls] were grouped into four categories: total mafics, quart[z] plagioclase, and potassium feldspar. A qualitative un[i]variate analysis of the geographic distribution and pe[r]centage data is illustrated by map figures and compare[d] with the quantitative method. The geological significan[ce] of areal variations is discussed, and the data are subjecte[d] to multivariate variance analysis which confirms suspecte[d] regional homogeneity and disproves the existence [of] significant local variations. [Author's abstract.]

R. B. F.

[Eliseev (N. A.)] Елисеев (Н. А.). К вопросу о классифик[а]ции нефелиновых горных пород. [*On the classificati[on] of nepheline rocks.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1957, **86**, 629–631, 1 fig.

A new classification of the nepheline-bearing igneous ks has been drawn up by a group of petrologists working the Kola peninsula. It is represented graphically on the angular diagram nepheline—alkali feldspar—coloured nerals (mainly alkali pyroxene). S. I. T.

ALKER (G. P. L.). *Geology of the Reydarfjördur area, eastern Iceland.* Quart. Journ. Geol. Soc. London, 1958, **114**, 367–393, 2 pls., 7 figs.

A succession of nearly 15,000 ft. of volcanic rocks, predominantly of fissure eruption, comprises interbedded oleiites, olivine-basalts, and porphyritic basalts (rich in henocrysts of calcic plagioclase), with subsidiary rhyolites, citites, andesites, and pyroclastic deposits. A swarm of ter dykes, mostly basic, has a general northerly trend. W. J. W.

UTTEN (M. G.). *The geology of Videy (Iceland).* Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, Deel **16** (Gedenkboek H.A. Brouwer), 294–402, 12 figs.

The island of Videy is formed of an older non-glacial ries of Tertiary plateau basalts with related tuffs and abbroic intrusions, partly covered by an olivine dolerite of he Quaternary last interglacial period. Neither the older younger igneous rocks can be attributed to sub-glacial ulcanism. R. A. H.

REVER (H. I.) & JOHNSTON (R.). *The lower margin of the Shiant Isles sill.* Quart. Journ. Geol. Soc. London, 1959 (for 1958), **114**, 343–365, 10 figs, 2 pls.

The rocks below the picrite layer in the Garbh Eilean sill, nd in contact with the underlying Jurassic marls, are a eterogeneous group of contaminated rocks, chiefly teschnitic, with unusual textures. The textures, mineralogy, nd field relations of the rocks are described in detail. hemical analyses of marls, picritic rocks, and teschenitic ocks from the lower margin are given. It is suggested that he teschenites were produced, on a limited scale, by interction between marl and picritic materials rich in water and oda, and that in such cases titanaugite developed at the xpense of olivine. [M.A. **12**–418] W. J. W.

ILLEY (C. E.). *Some new chemical data on assemblages of the Assynt alkali suite.* Trans. Edinburgh Geol. Soc., 1958, **17**, 156–164, 1 fig., 1 pl.

Seven new analyses of rocks belonging to the Assynt lkali suite of north-western Scotland and one new analysis f a borolanite from the Bear Paw Mountains of Montana re reported. The Assynt rocks include representatives of he Loch Borolan mass and of the associated dyke swarm. G. P. B.

BLACK (G. P.). *The junction between Jurassic sandstones and Tertiary granophyre near Dunan, Isle of Skye: a re-interpretation.* Trans. Edinburgh Geol. Soc., 1955, **16**, 217–222.

Re-examination of the granophyre-sandstone contact exposed on the shore at Dunan shows that the relationship is not intrusive, as has been previously maintained, but is marked by a powerful fault. A series of rocks, regarded as metasomatized sandstone by a previous worker, are recognised as cataclastic; the true aureole of the granophyre has been faulted out. [M.M. **30**–263] R. A. H.

FRANCIS (E. H.). *New evidence of volcanicity in west Fife.* Trans. Edinburgh Geol. Soc., 1957, **17**, 71–80.

A recent bore encountered a previously unknown tuff bed of considerable thickness in the Limestone Coal Group of west Fife; eight further tuff horizons have also been found at various levels in the Upper Limestone Group. Some of the tuffs consist entirely of fragmented sedimentary rocks, others show an intermingling of igneous and sedimentary fragments. G. P. B.

BUIST (D. S.). *The bostonite of Rudh'a' Chromain, Carsaig, Mull.* Geol. Mag., 1958, **95**, 463–464.

A brief petrographical description of bostonite, with a chemical and a spectrographical analysis. W. J. W.

COCKBURN (A. M.). *Notes on the geology of the eastern slopes of Blackford Hill, Edinburgh.* Trans. Edinburgh Geol. Soc., 1956, **16**, 307–312.

Two flows of basalt, separated by a tuff, very similar to the well-known 'Carnethy Porphyry' of the Pentland Hills, were exposed during building operations. The top of the higher flow showed a complex system of veining by calcareous siltstone; in places pillow-shaped masses of basalt were found sheathed in sediment. The flow was erupted under water and the sediment deposited in fissures in the chilled top shortly before final consolidation. G. P. B.

HARRY (W. T.). *Old Red Sandstone lavas of the eastern Sidlaws.* Trans. Edinburgh Geol. Soc., 1958, **17**, 105–112.

The lava succession of the eastern Sidlaw Hills (Angus) comprises various types of basalt including two-pyroxene basalt and andesine-basalt. The succession here is much thinner than that of the western part of the Sidlaw Hills [M.A. **14**–66] with which comparisons are drawn. Two new analyses of two-pyroxene basalts are given. G. P. B.

BAILEY (E. B.) & MCCALLIEN (W. J.). *The Ballantrae serpentine, Ayrshire.* Trans. Edinburgh Geol. Soc., 1957, **17**, 33–53.

It is concluded from field study that the Ballantrae serpentinite has the form of a highly folded sheet lying concordantly in a sequence of Ordovician spilitic lavas. The spilites below the sheet are seen in the cores of two anticlines and are surrounded by serpentinite ; those above the sheet are restricted to complementary synclines. The metamorphism of argillaceous sediments in proximity to the serpentinite was previously regarded as demanding an intrusive origin for that rock. The phenomenon is now ascribed to numerous small basic intrusions traversing the sediment and the serpentinite is considered to be a submarine lava erupted under rather deep water. G. P. B.

Firman (R. J.). *The Borrowdale volcanic series between Wastwater and Duddon Valley, Cumberland.* Proc. Yorks. Geol. Soc., 1957, **31**, 39–64, 3 pls., 4 figs.

A map of the volcanic series is accompanied by a description and discussion of the succession and the conditions of accumulation ; petrographic notes are given for each division of the lavas and tuffs. Garnetiferous welded tuffs are recorded. Pre-Upper-Ordovician folding is described. The Eskdale granite is later than some of the Caledonian folding and the form of its aureole suggests that only its roof is exposed over most of the area. R. St J. L.

Eyles (V. A.) & Blundell (C. R. K.). *On a volcanic vent and associated monchiquite intrusions in Monmouthshire.* Geol. Mag., 1957, **94**, 54–57.

A monchiquite cuts an agglomerate containing blocks of monchiquite and sediments dateable as Lower Carboniferous. A Lower Carboniferous (preferable) or possibly Permian age is suggested. R. St J. L.

Brousse (Robert). *Mode de formation de cordiérite du granite de la Palisse (Ardèche).* Bull. Soc. franç. Min. Crist., 1957, **80**, 39–48.

Study of the cordierite-granite of Palisse shows that there has been assimilation of pre-existing aluminous rocks in the course of its emplacement ; subsequent segregation has caused formation of nodules of cordierite. The migration of each of the ions in the course of this process is discussed, and a method of calculation to compare their relative variation is proposed. Three analyses are given, 2 of which are new : (A) granite, (B) cordierite nodule, analyst P. Blot : SiO_2 67·60, 69·40, Al_2O_3 17·20, 16·60, Fe_2O_3 0·10, 0·10, FeO 2·50, 4·00, MgO 0·50, 3·80, CaO 2·10, 0·50, Na_2O 3·55, 0·14, K_2O 4·50, 1·90, H_2O+ 1·10, 2·50, H_2O- 0·20, 0·60, TiO_2 1·10, 1·05, P_2O_5 0·35, 0·21, = 100·80, 100·80, for (A) and (B) respectively. E. J. & A. S.

Graindor (Maurice-J.) & Roblot (Marie-M.). *Observations sur les îlots rocheux situés au Nord de Granville (Manche).* Bull. Soc. géol. France, 1956, **6**, 115–120.

Stratigraphical observations in and corrections to map of the Cotentin. The authors have discovered qua diorite with biotite and amphibole at Chaussée des Boe survey mark between Saint-Brieuc and Coutances.

E. J. & A. S

Michel (R.). *Premiers résultats de l'étude pétrographi des schistes cristallins du massif d'Ambin (Alpes fran italiennes).* C.R. Somm. Soc. géol. France, 19 pp. 121–123.

Two groups can be distinguished in the Italian sec (between Doire Ripaire on the S., Ambin on the N., Cla on the E., and Galambra on the W. of the massif of Ambi (1) at the base the Clarea group composed of siliceous mi schists with glaucophane and garnet ; (2) albite gneiss w phengite and chlorite towards W. and N. This gneiss derived by retrograde metamorphism and albitization fr former mica schists with two micas, which are of p Alpine age. E. J. & A. S

Michel (Robert) & Vernet (Jean). *Une cheminée canique Triasicoliasique en Dauphiné. : l'Aigu Fourchée (secteur Sud du Pelvoux, Hautes Alpes).* C Acad. Sci. Paris, 1956, **242**, 3096–3097.

The existence of a centre of eruption of Trias-Lias age a probably of andesitic character in the crystalline rocks the Pelvoux massif is demonstrated. E. J. & A. S

Collomb (Pierre). *Formations acides d'origine érupt dans la série cristallophyllienne du Rouergue.* C somm. Soc. géol. France, 1957, pp. 58–61.

An important part of the gneisses of central and weste Rouergue originates from acid eruptive rocks (grani microgranite, rhyolite). The rocks are rich in silica, p in iron, magnesia, and lime ; potash predominates o soda. Seven analyses are given including : the Requi porphyry, Palanges microgranite and granite, Le Tér augen-gneiss, sericitic gneiss of Gorges du Lézert, Na orthogneiss, augen gneiss of La Mouline ; the compositio of all these rocks are very close. E. J. & A. S

Gigout (Marcel). *Le volcan sous-marin d'âge acadien Sidi-Said-Maâchou (Maroc occidental).* Bull. Soc. gé France, 1956, **6**, 559–574.

A submarine volcanic assemblage has been discovered Green Beds of Acadian age. The strata are cut vertica by numerous dykes of dolerite from one of which flows a sills emanate. The sills are doleritic, the lava is a fi grained, intersertal basalt and is accompanied by tuf Comparison with other volcanic occurrences in the Acadi of Morocco is drawn, and a brief review of submari vulcanicity in the world is given. E. J. & A. S.

EYER (ANDRÉ). *Un type particulier de roche carbonatée au Ruanda (Afrique Centrale).* C.R. Acad. Sci. Paris, 1957, **245**, 976–978.

At Kibuye (E. bank of Lake Kivu) the crystalline series cut by dolerite dykes and two discordant dolomitic bodies so seem to be intrusive. Nine chemical analyses are given: of dolerites, 2 of contact rocks analogous to those met at ıe margins of the carbonatites of Lueshe [M.A. **14**–154], of the Kikuye carbonatites, and one tremolite.

E. J. & A. S.

ELANY (F. M.). *Observations on the Sabaloka Series of the Sudan.* Trans. Geol. Soc. S. Africa, 1958, **61**, 111–124, 1 pl., 4 figs.

The Sabaloka Series comprises flows of rhyolite and achyte with associated pyroclastics, all of pre-Mesozoic, robably late Precambrian age, which rest unconformably pon older crystalline schists and gneisses some 80 km north f Khartoum. Related intrusive alkali rocks (soda syenites nd granites with essexite and gabbro) occur as stocks and ing-dykes in several localities over a wide area. Field and icroscopic descriptions are given. E. S. W. S.

VEECKSTEEN (GUY). *Sur la présence d'ignimbrites dans le Cameroun occidental.* C.R. Acad. Sci. Paris, 1957, **244**, 911–913.

After giving detailed macro- and micro-scopic descriptions the author states that the ignimbrites of the western Cameroon occur as (*a*) tabular deposits, of New Zealand ype, in the Nko-Gam mass, and (*b*) a thin covering over regular topography, of S.E. Idaho type, in the Mbam mass. t is suggested that they are of Neogene age.

E. J. & A. S.

IGAZY (RIAD A.) & WASFY (HUSSEIN M.). *Remarks on the age of granites in Egypt.* Egypt. Journ. Geol., 1957, **1**, 85–91. (With summary in Arabic, p. 92.)

The authors correlated the pre-Cambrian rocks in Egypt vith those of other African countries, with special reference o the Shaitian and Gattarian granites. E. M. El S.

OORNICK (N. H. VAN). *The Walha granite boss, near Adigrat, Tigrai Province, northern Ethiopia.* Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwer), 56–63, 2 figs.

A pink, coarse-grained, two-mica granite boss is reported ntruded through pre-Cambrian(?) schists in northern thiopia. It is largely overlain by Jurassic sandstones and as a metamorphic aureole in the schists. R. A. H.

DANIELS (J. L.). *A preliminary investigation of some basic intrusions in the Hargeisa and Borama districts of Somaliland Protectorate.* Trans. Geol. Soc. S. Africa, 1958, **61**, 125–136, 1 pl., 1 fig.

Field and petrographic descriptions are given of five (out of some 30) stock-like basic intrusions, all of which show pronounced layered structures and are composed of gabbro, olivine gabbro, troctolite, anorthosite, peridotite, pyroxenite, and iron ore. Very coarse pegmatitic gabbro forms transgressive bodies. Unusual rock types recorded are orbicular gabbros, spinel-corundum rocks, and banded pleonaste-hercynite and pleonaste-hypersthene rocks associated with iron ore. E. S. W. S.

BROWN (P. E.). *The Ubendian rocks of the Igawa area (Quarter Degree Sheet 71 SW., Chimala).* Rec. Geol. Surv. Tanganyika, 1958, **6**, 5–7, 1 pl.

A Precambrian metamorphic terrain including a granodiorite-adamellite intrusion (Ubena Granite), a tonalite-granodiorite intrusion (Msusule Intrusive), a remarkable orbicular migmatite, and a meta-anorthosite complex is given preliminary description with little petrographic detail and no chemical data. D. McK.

FOZZARD (P. M. H.). *Geology of the Nachingwea area in the Southern Province of Tanganyika.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 8–13.

A Precambrian metasedimentary series, including small ultrabasic bodies and lying to the east of a large granitic injection complex, is given preliminary description. Partial chemical analyses are reported for 15 crystalline limestones. D. McK.

PICKERING (R.). *Geology of the Oldoinyo Gol.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 35–37.

A preliminary description is given of a region of Precambrian metamorphic rocks overlain by Neogene trachytic and phonolitic lavas and tuffs. D. McK.

JAMES (T. C.). *Carbonatite investigation: progress report.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 45.

The discovery of two new carbonatite occurrences, at Wigu Hill, near Kisaki, and of one on the west flank of Hanang is recorded. At Wigu Hill sövite with accessory monazite, bastnäsite, florencite, pyrochlore, blende, baryte, strontianite, and pyrite brecciates Precambrian gneiss. D. McK.

BLOOMFIELD (K.). *The Chimwadzulu Hill ultrabasic body, southern Nyasaland.* Trans. Geol. Soc. S. Africa, 1958, **61**, 264–282, 3 pls., 2 figs.

A small body of amphibolite and serpentinised peridotite occurs in paragneisses. The amphibolite is epidotised and occasionally garnetiferous and corundum-bearing. Associated rocks carry actinolite, tremolite, and nephrite, while pods of chlorite-talc rock occur in the peridotite. Detailed petrographic descriptions are given together with an analysis of hornblende from amphibolite and qualitative spectrochemical analyses of rocks and mineral phases. Petrogenetic problems are discussed at some length.

E. S. W. S.

Aderca (B.). *La mine des Kibara (Katanga, Congo Belge). Etude pétrographique et géologique.* Mem. Acad. roy. Sci. colon., Classe Sci. Nat., Bruxelles, 1955, no. 3, 77 pp., 3 pls., 34 photomicros.

A macroscopic and microscopic description of the rocks at the base of the Kibara System comprising phyllites, quartzites, quartz-phyllites, mica-schists, and sericite-phyllites. This petrographical study shows a very complex geological history involving successively regional epi-metamorphism, granitization, additive metamorphism (tourmalinization), and lastly a phase of mineralization (by sulphides and various oxides especially cassiterite). J. M.

Delhal (J.). *Sur le volcanisme ancien du Sud-Kasai (Congo Belge).* Bull. Soc. belge Géol., 1958, **67**, 179–187, 1 map.

A petrographical study of the green rocks of the valley of the R. Lueta and of the area E. of the R. Lulua, and also of the clastic and pyroclastic deposits connected with the local eruptive phenomena. F. Sch.

Denaeyer (M. E.) & Ledent (D.). *Caractères chimico-minéralogiques d'une kivite du volcan Mihaga (massif du Nyamuragira). Coulée de Mushumangabo, février-mars 1954.* Bull. Acad. roy. Sci. colon., Bruxelles, 1954, no. 25, 1578–1587. [Preliminary note.]

A lava from the volcano Mihaga (Kivu, Belgian Congo) is a typical kivite. The structure is microlitic with predominant plagioclase (70–73% An) and titaniferous pyroxene, and with leucite and some olivine and abundant opaque minerals (titaniferous iron ore). The glass is golden yellow, limpid, with $n \approx 1{\cdot}59$. Anal. by D. Ledent gave SiO_2 46·22, Al_2O_3 16·31, Fe_2O_3 1·88, FeO 10·42, MgO 4·05, CaO 11·20, Na_2O 3·21, K_2O 3·78, H_2O+ n.d., H_2O- 0·02, TiO_2 3·17, P_2O_5 0·26, MnO 0·19, =100·71. Comparison is made with other kivites. J. M.

Meyer (A.) & Burette (H.). *Nouveaux phénomènes volcaniques au Sud-Kivu (Congo Belge).* Serv. Géol. Congo Belge, 1957, Bull. **7**, fasc. 4, 15 pp., 2 figs., 2 pls.

The South Kivu volcanic region is formed by trachytes and basalts of probable late Tertiary age, followed Quaternary volcanics. A set of recent small basaltic v canics and associated flows are recorded south-east of rhyolitic Mt. Kahusi. Five chemical analyses of bombs flows demonstrate the simultaneous presence in a sin vent of a silica-deficient basalt and a silica-saturated fr tion ; the saturated fraction is thought to be derived local differentiation in the underlying chamber, w settling of about 12% olivine and 4% pyroxene cryst [M.A. **11**–39] R. A. H

Denaeyer (Marcel E.) & Tazieff (Haroun). *Nature d lave actuelle et de quelques laves plus anciennes de caldère du Nyiragongo (Kivu).* C.R. Acad. Sci. Pa 1957, **244**, 218–221.

Molten lava forms a pool at the bottom of the pipe wh opens into the Nyiragongo Caldera ; its composition typical of the leucite-nephelinites which constitute a gr part of this volcanic edifice. Most of the bedded flows wh form the walls and the floor are of the same nature. F analyses are listed, three being new : (A) porphyri leucite-nephelinite (anal. Heirwegh), (B) melilite-étind (anal. Heirwegh), (C) Pélé's hair (anal. Bothwell).

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O+	H_2O-	T
A	42·48	19·60	4·52	4·57	3·19	10·50	4·92	7·37	nil	nil	100
B	40·98	14·85	4·40	7·98	4·46	13·15	5·89	2·12	1·18	1·60	100
C	39·1	14·4	2·3	10·1	5·5	11·0	5·4	4·9	1·8	—	99

Totals include : TiO_2 2·16, 2·39, 2·9 ; P_2O_5 1·03, 1·25, 2·2 ; MnO 0·31, 0·27, 0·1 A, B, and C respectively, and also S 0·1 in C.

E. J. & A. S.

Béthune (P. de) & Meyer (A.). *Carbonatites in Ki* Nature, 1957, **179**, 270–271.

A plug and dykes of carbonatite intrude kyanite-garnet-bearing schists and limestone of the Urundi-Ruz series in the Lueshe Valley, on the plateau S.W. of the La Edward Rift. Aegirine- and biotite-sövites are surround by a ring of cancrinite-calcite-syenite (busorite) ; t complex may be related to the North Kivu potas province. [M.A. **14**–154, 356] D. McK.

Holmes (Arthur). *The ejectamenta of Katwe crater, sou west Uganda.* Kon. Ned. Geol.-Mijnbouwk. Genoo schap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwe 139–166, 4 figs., 1 pl.

The pyroclastic ejectamenta of the Katwe crater, no of Lake Edward in the western rift valley, comprise b the foundation rocks, mainly of the epidote-amphibol facies and their minerals, biotite-pyroxenite, and relat cognate sub-volcanic rocks and their minerals, and a lapilli, bombs, and ejected blocks of volcanic rocks such katungite, alnöite, ugandite, and members of the anka trite-melaleucitite series. Petrographic descriptions of t various rock types are given and ten new chemical analy

e included in those listed. The Katwe rocks are relatively her in sodium than most of those from the rest of this tassium-rich province. Sialic inclusions are ubiquitous d in some examples have been progressively transformed leucite and leucitite [M.A. **9**–166]; the transformation oligoclase to haüyne and the complementary develop-ent of pyroxene in place of melilite are also recorded. It postulated that the olivine-biotite-pyroxene rocks are arn-like products generated by reactions between a rbonatite fluid and sialic rocks. The relative abundances oxygen and carbon isotopes in some of the carbonate cks are tabulated [M.A. **11**–457]; the values for the rbonatites are essentially equivalent to a juvenile origin id different from those of nearby limestone and dolomite. [M. **8**–228, **24**–408, **26**–197; M.A. **7**–37, **12**–146]

R. A. H.

cCall (G. J. H.). *Geology of the Gwasi area, Kenya Colony.* Geol. Survey Kenya, Rept. no. 45, 1959, 88 pp., 11 figs., 13 pls., 3 coloured maps.

This report deals with the carbonatite and alkaline mplexes, and associated alkaline volcanic suite, which cur at Rangwa and Ruri in western Kenya. The Pre-mbrian country rocks are also described. Melilite occurs Rangwa (together with its alteration product cebollite) the ultrabasic intrusive rocks uncompahgrite, turjaite, id alnoite and in the lava type, melilitite. Columbian erovskite (CaO 39·65, TiO_2 56·36, Nb_2O_5 0·56, Fe_2O_3 1·30, R 0·73, Ta_2O_5 n.d., = 98·60; analyst P. J. Moore), pyro-hlore, melanite, and vesuvianite all occur at Rangwa and uri; monazite occurs at Ruri. Pyrochlore and apatite are f possible economic value. The carbonatites are calcitic övite, alvikite). Two analyses, with norms and modes, are iven of biotite-uncompahgrite: SiO_2 34·68, 33·73, Al_2O_3 ·70, 7·18, Fe_2O_3 7·30, 9·11, FeO 7·28, 6·79, MgO 7·48, 8·77, aO 30·12, 26·89, Na_2O 1·84, 1·88, K_2O 0·45, 1·15, H_2O+ ·99, 0·62, H_2O- 0·14, 0·06, CO_2 0·18, 0·98, TiO_2 1·75, ·05, P_2O_5 n.d., n.d., SO_3 0·02, n.d., Cl 0·06, tr, F tr., n.d., 0·15, n.d., Cr_2O_3 n.d., 0·13, MnO 0·14, 0·18, BaO 0·03, ·03, total TR and ThO_2 tr., 0·14, Nb_2O_5 0·08, 0·10, = 99·39, 9·79, less O for Cl and S 0·02, —, = 99·37, —; sp. gr. 3·31, ·18; analyst J. M. Stephens. An analysis of pyrochlore-earing carbonatite (with Nb_2O_5 0·28%) by W. P. Horne given.

W. P.

IcKinlay (A. C. M.). *Kimberlite intrusions cutting Karroo sediments in the Ruhuhu depression of south-west Tanganyika.* Rec. Geol. Surv. Tanganyika, 1958, **5**, 63–80.

Three pipes of kimberlite and kimberlitic breccia intrude pper Karroo sandstones at Kiwurungi. The 'soft ground' the centre of the intrusions contains mineral and rock fragments in a matrix of chlorite, talc, and 11–67% of carbonate minerals; it is separated by contact breccia from carbonated country rocks. Analysis of massive kimberlite containing cores of fresh olivine gave SiO_2 30·22, Al_2O_3 3·93, Fe_2O_3 6·39, FeO 3·82, MgO 24·78, CaO 11·27, Na_2O 0·24, K_2O 2·02, H_2O+ 6·18, H_2O- 0·48, TiO_2 3·37, P_2O_5 1·14, MnO 1·16, CO_2 6·03, = 101·03. Olivine is normally altered to chlorite, which is progressively replaced by carbonates, quartz, and ore. Kimberlite and mica-kimberlite dykes intrude country rocks and perhaps the pipes; analysis of a kimberlite dyke gave SiO_2 25·96, Al_2O_3 3·42, Fe_2O_3 5·95, FeO 3·64, MgO 23·46, CaO 14·24, Na_2O tr., K_2O 0·88, H_2O+ 7·86, H_2O- 0·40, TiO_2 2·88, P_2O_5 0·82, MnO 0·39, CO_2 10·22, = 100·12. A carbonated ultrabasic dyke intrudes and carbonates Lower Karroo arkoses at Kitete, 3 miles to the north.

D. McK.

Fozzard (P. M. H.). *Further notes on the volcanic rocks from Igwisi.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 69–75, 1 pl.

History of previous work and petrographic descriptions are given for the lavas and tuffs of kimberlite-carbonatite affinities from the Igwisi volcanoes in western Tanganyika. Olivine ($Fa_{6·6}$-$Fa_{8·1}$) xenocrysts lie in a vesicular groundmass of calcite, perovskite, chlorite, and glass, and are more magnesian than in the kimberlites (Fa_{11}) or the Kiwurungi pipe rocks (Fa_9) [see preceding abstr.]. Nb_2O_5 ranges 0·03–0·05% for 11 volcanic rocks from Igwisi compared with <0·002–0·08% (average 0·02%) for 20 kimberlite specimens from Tanganyika. The Igwisi volcanics may be a surface equivalent of kimberlite.

D. McK.

Harpum (J. R.). *The petrology of the Sigi phonolite.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 28–29.

A phonolite dyke on the coast north of Tanga is related to the Jombo alkaline complex. Analysis gave SiO_2 51·86, Al_2O_3 20·88, Fe_2O_3 1·71, FeO 1·53, MgO 0·33, CaO 2·52, Na_2O 8·05, K_2O 4·64, H_2O+ 5·99, H_2O- 0·45, TiO_2 0·32, P_2O_5 0·20, MnO 0·21, CO_2 1·16, = 99·85; sp. gr. 2·33. High CO_2 also characterizes a phonolite from Engelosin, Masailand, for which analysis gave SiO_2 52·04, Al_2O_3 20·28, Fe_2O_3 3·36, FeO 1·74, MgO 0·69, CaO 3·56, Na_2O 8·64, K_2O 4·03, H_2O+ 2·10, H_2O- 1·18, TiO_2 0·58, P_2O_5 0·25, MnO 0·25, CO_2 1·15, = 99·85; sp. gr. 2·46.

D. McK.

Drever (Harold I.). *Geological results of four expeditions to Ubekendt Ejland, west Greenland.* Arctic, 1959, **11**, 198–210, 7 figs.

A thick series of olivine-rich lavas is cut by minor intrusions of picritic type, the lower of two lava groups being characterized by a spectacular development of vesicular banding with calcic zeolites in the vesicles. At the southern

end of the island the lavas are injected by sheets of fayalite-porphyry and felsite, bordering a major intrusive mass which includes banded gabbro, intermediate rocks, granophyre, and quartz-syenite. [M.M. **27**–11 ; M.A. **13**–409, **14**–147] R. A. H.

Stevenson (Louise Stevens). *The petrology of pumice in British Columbia.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 405–407.

Dacite pumice is found in the Bridge River and Lillooet River areas of western British Columbia. The rocks are described petrographically, and an analysis, by E. V. Kerr, of the Bridge River pumice is given. W. A. W.

Ross (Clarence S.). *Welded tuff from deep-well cores from Clinch County, Georgia.* Amer. Min., 1958, **43**, 537–545, 2 figs.

Drill cores from a depth of 4000 feet from Clinch County, southeastern Georgia, disclose a type of volcanism not previously recognized in the region. The record begins with a fine-grained volcanic conglomerate of andesite and welded fragments of dacitic tuff. Above the conglomerate is about 35 feet of rhyolitic welded tuff replaced by laumontite. This, in turn, is overlain by transported volcanic conglomerate materials. Low-grade metamorphism has affected the volcanic materials but without disturbing their relationships. A. P.

Harris (Rae L., *Jr.*). *Geologic evolution of the Beartooth Mountains, Montana and Wyoming. Part* 3. *Gardner Lake area, Wyoming.* Bull. Geol. Soc. America, 1959, **70**, 1185–1216, 10 figs., 5 pls.

The Gardner Lake area, in the Precambrian core of the Beartooth Mts., consists mainly of granitic gneiss and amphibolites with minor migmatites and mafic intrusive rocks. Open folds are traceable through metasediments and migmatites into granitic gneisses. Gradation from metasediments to pink leucocratic gneiss is indicated by distribution of mapable units, abundance and composition of feldspars and ferromagnesian minerals, percentage and character of rounded and overgrown zircons, length-width ratios of zircons, and chemical variation. Replacement in place by hot alkaline solutions is suggested as the origin of the granitic gneisses. Optical properties and chemical analyses are given for four biotites and three hornblendes, two pairs of which coexist. Measured modes and optical properties of the major minerals are given for 30 rock samples for 16 of which chemical analyses are also given. The petrogenesis of the rocks and the chronology of the petrological and structural events are discussed. A. L. A.

Hamilton (Warren). *Chemistry of granophyres fr[om] Wichita lopolith, Oklahoma.* Bull. Geol. Soc. Ameri[ca], 1959, **70**, 1119–1126, 2 figs.

The Wichita Mountains of southwestern Oklahoma exp[ose] the upper part of a large lopolith of late Precambrian [to] early Cambrian age [for field relations and petrography s[ee] op. cit., **67**, 1319–1330]. A thick sheet of many masses [of] red granophyre and allied granite and rhyolite overl[ies] gabbro and anorthosite ; the red rocks dominate the prese[nt] exposures. Descriptions and modal, gravimetric, a[nd] spectrographic analyses are given for four samples [of] Wichita granophyres, together with three analyses pu[b]lished previously. Differences in radiometric ages a[nd] petrologic character between the Wichita and Arbuc[kle] basement provinces are emphasized. A. L. A.

Engel (Celeste G.). *Igneous rocks and constituent hor[n]blendes of the Henry Mountains, Utah.* Bull. Geol. S[oc.] America, 1959, **70**, 951–980, 4 figs.

A series of hypabyssal intrusions in the Henry Mt[s] consisting almost entirely of diorite-porphyry but with ra[re] monzonite-porphyry is studied mineralogically and chem[i]cally. The variation in hornblende, the principal ma[fic] constitutent of both porphyries and of inclusions, [is] described. Many modal, gravimetric (complete and parti[al]) and spectrographic analyses of the two types of porphy[ry] and gravimetric and spectrographic analyses of the hor[n]blendes in the porphyries and in the inclusions are give[n]. The diorite porphyry is very uniform mineralogically a[nd] chemically ; the monzonite-porphyry, by which the oth[er] locally is cut or into which it grades, is more variab[le]. Most hornblende phenocrysts in the diorite-porphyry a[re] chemically alike with FeO : MgO about 0·9 to 1·1. T[he] large hornblende phenocrysts from a coarse-grained laccoli[th] have FeO : MgO about 0·4 ; this more magnesian hor[n]blende is similar in composition to most hornblendes fro[m] mafic inclusions in the diorite-porphyry. The origin of t[he] two magmas and of the inclusions is discussed. A. L. A.

Egeler (C. G.) & Booy (T. De). *Some quantitative miner[a]logical and chemical data on a complex pluton, Cordille[ra] Blanca, Peru.* Kon. Ned. Geol.-Mijnbouwk. Genoo[t]schap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwe[r]) 76–83, 4 figs.

Tonalite, granodiorite, and leucogranodiorite are reco[g]nised as the main components of part of a complex plut[on] in the Cordillera Blanca. Modal analyses are presented an[d] their value for the choice of representative samples f[or] chemical analysis is stressed. The results of chemic[al] analysis of the three major components and of a gran[o]diorite-porphyry are given : simple linear differentiation [is] indicated. R. A. H.

GGLI (PAUL). *The chemistry of the volcanic rocks of [the] Hawaiian Islands.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 358–361.

A brief abstract is given of a classification of the volcanic cks of the Hawaiian Island group using as a basis the ain collective components Q, L, and M of the molecular orms calculated from many recent analyses. W. A. W.

IYAKE (YASUO) & SUGIURA (YOSHIO). *On the chemical compositions of the volcanic eruptives in New Britain Island, Pacific Ocean.* Proc. 7th Pacific Science Congress (Auckland and Christchurch meeting), 1953 (for 1949), **2**, 361–363, 1 fig.

Analyses of basaltic and andesitic lava, lapilli, and olcanic sand from the volcanic group near Rabaul are given nd briefly discussed. W. A. W.

AADEN (G. VAN DER). *Age relations of magmatic activity and of metamorphic processes in the northwestern part of Anatolia-Turkey.* Bull. Min. Res. Exploration Inst. Turkey, 1959, **52**, 15–33, 2 folding geol. maps, 4 figs.

Pre-Variscan schists represent a geosynclinal series of sediments. Palaeozoic sediments, spilites, and peridotites experienced a Variscan epi-metamorphism; glaucophane of his age was destroyed by the thermal action of late Variscan granodiorites; mineralization (W, Mo, Fe, Zn, Cu, S, F) is associated with late unfoliated Variscan batholiths. Volcanic activity occurred in the Cretaceous (spilites, keratophyres) and in the early Tertiary (andesite and dacite lavas and tuffs); the latter, leached and kaolinized on a regional scale, are overlain by lignite-bearing Miocene.

J. Ph.

AGDASAROV (E. A.)] Багдасаров (Э. А.). Щелочные пегматиты массива Африканда. [*Alkaline pegmatites of the Africanda massif.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**(3), 261–274, 2 figs.

The pegmatites of the pyroxenite-melteigite complex of Africanda in the Kola peninsula, are described. Three main types are distinguished: (1) knopite-titanomagnetite-schorlomite-nepheline, (2) pyroxene-schorlomite-nepheline, (3) pyroxene-nepheline. According to their mode of emplacement pegmatites are divided into fissure-pegmatites and migmatite-pegmatites. The last variety is usually accompanied by resorption and replacement leading to the formation of hybrid pegmatites. S. I. T.

AFFENGOLTZ (K. N.)] Паффенгольц (К. Н.). Эльбрус (геологический очерк). [*Elbrus (geological survey)*]. Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1959, no. 2, 3–24, 5 figs.

An account is given of the geological structure of Elbrus, the highest mountain in Europe (5633 metres). The lava cone of Elbrus, some 2000 m thick is made of a lower series of lavas and tuffs of Oligocene age, on the average corresponding to liparite-dacite. An upper series forms the summit volcano and with a few valley lava flows, of Pliocene age, corresponds to dacite in composition. There are also given 30 previously published and 2 new chemical analyses of lavas and tuffs. S. I. T.

DESIO (ARDITO) & ZANETTIN (B.). *Sur la constitution géologique du K2 (8611 m) dans la chaine du Karakoroum (Himalaya).* Bull. Soc. géol. France, 1956, **6**, 829–837.

The mountain K2 is formed of rocks, originally sedimentary, which after regional metamorphism have been feldspathized by the neighbouring granite. The rocks include biotite-muscovite gneiss K2, knotted gneiss with large crystals of orthoclase and biotite, biotite-hornblende gneiss, other types of gneiss, and paraschists. Suggestions about the structure of K2 are put forward. E. J. & A. S.

[PETROV (V. P.) & SOKOLOVA (L. A.)] Петров (В. П.) и Соколова (Л. А.). Тальк из района города Джетыгары. [*Talc from the region of the town of Dzhetygary.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. Ore-deposits, Petr. Min. Geochem.], 1957, no. 10, 99–106, 4 figs.

A talc rock, a contact modification of peridotite, from a locality in the eastern part of south Trans-Urals, is described; its analysis is SiO_2 59·30, TiO_2 abs., Al_2O_3 1·01, Fe_2O_3 1·00, Cr_2O_3 0·15, FeO 2·87, MnO 0·02, MgO 29·45, CaO 0·36, NiO 0·03, Na_2O+K_2O 0·31, CO_2 0·20, S 0·29, H_2O+ 4·49, H_2O- 0·12, volatiles 0·31, total 99·91. The approximate composition of the rock is: talc 90, chlorite 5, magnetite and chromite 2, carbonates > 1, excess SiO_2 2%. The heating curve is given. S. I. T.

[ELISEEVA (O. P.)] Елисеева (О. П.). Акцессорные минералы интрузивных пород юго-восточного склона кураминского хребта района Ашаба—Чадак. [*Accessory minerals of intrusive rocks of the south-eastern slope of Kuraminsky ridge of the region Ashaba-Chadak.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Pet. Min. Geochem.], 1957, no. 5, 75–96, 16 figs.

Various types of granites and granodiorites from Kuraminsky ridge, S.E. of Tashkent, are described but the main part of the paper is devoted to the description of accessory minerals of the granitic rocks, zircon, apatite, orthite, sphene, anatase, fluorite, tourmaline, cassiterite, naëgite, and others. S. I. T.

[Yudin (M. I.)] Юдин (М. И.). Дуниты хребта Борус и их происхождение. [*Dunites of Borus mountain range and their origin.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1959, no. 2, 59–77, 12 figs.

Enstatite dunite and pyroxenite are found associated with serpentinite and serpentinized peridotite. Evidence is set forth in support of the hypothesis that pyroxenite and dunite are products of a two-stage metasomatism by magnesium- and silica-rich solutions. S. I. T.

[Eremeev (V. P.)] Еремеев (В. П.). Материалы по петрографии и нерудным ископаемым юго-восточной и западной Тувы. [*Materials on the petrography and on the non-metalliferous deposits of the south-eastern and western Tuva.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. Ore-deposits, Petr. Min. Geochem.], 1957, no. 10, 108–142, 18 figs.

Supported by modal and chemical analyses a petrographical description is given to intrusive igneous rocks ranging in age from the Proterozoic to the Carboniferous. The rocks are granite, pegmatites, gabbro, diorite, and certain ultrabasic rocks. S. I. T.

[Ereemeev (V. P.)] Еремеев (В. П.). Петрография и нерудные ископаемые южной части Срединного Камчаткого хребта. [*Petrography and non-metallic deposits of the southern part of the Middle Kamchatka ridge.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. Ore-deposits, Petr. Min. Geochem.], 1957, no. 17, 107–142, 11 figs.

A detailed petrographical description is provided of granites, pyroxenites, gneisses, pegmatites, dacites, quartz-diorites, monzonites, as well as of xenoliths and contact rocks. S. I. T.

[Rub (M. G.)] Руб (М. Г.). Грейзены юго-западного Приморья и их генезис. [*Greisens of the south-western Primorie and their genesis.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. Ore-deposits Petr. Min. Geochem. 1957, no. 5, 97–163, 54 figs.

This is a very detailed study of greisens of the maritime province of the Far East, comprising field description, chemical, and modal analyses, optical and spectroscopic studies. It is concluded that greisenized granites and greisens are confined to the apical parts of small granite stocks and domes and to endocontact zones. Some country rocks are also greisenized. Various types of greisens and their minerals are described. Among the accessories zirc is the dominant mineral, while present in small amou are tourmaline, fluorite, and cassiterite. Two stages greisenization are distinguished : (1) regional stage, char terized by muscovitization of biotite, replacement of felds by quartz and mica and formation of tourmaline, fluori topaz, and cassiterite ; (2) local stage, characterized more intense effect and by ore mineralization with formation of cassiterite, wolfram, pyrite, and blen Detailed accounts of types of greisens, minerals, and g chemical processes are given. S. I. T

Yagi (Kenzo). *Petrochemical studies on the alkaline ro of the Morotu district, Sakhalin.* Proc. 7th Paci Science Congress (Auckland and Christchurch meetin 1953 (for 1949), **2**, 274–280, 2 figs.

Minor alkaline intrusions of probable Miocene age in t western coastal region of Sakhalin include laccolitic bod showing trachybasalt or trachydolerite at the margins a drusy monzonite or syenite in the central parts. T boundaries between the inner and outer parts are usua gradational. Small dykes or sheets consisting entirely trachybasalt or trachydolerite are also present. Chang in the chief mineral series with advancing cryst lization differentiation in place are described. T petrography, petrochemistry, and petrogenesis of the su (alkali-lime index 50·0) are briefly discussed. Twenty ro and 20 mineral analyses by the author are given.

W. A. W.

Kuno (Hisashi). *Plateau basalt lavas of eastern Manchur* Proc. 7th Pacific Science Congress (Auckland a Christchurch meeting), 1953 (for 1949), **2**, 375–38 3 figs.

The plateau basalts of eastern Manchuria range fro middle Tertiary to Recent and are divided into 9 maj units, each with an independent centre or centres eruption. The lavas of 8 of these units are basalts a dolerites of olivine-basalt magma type ; late differentiat are represented by minor trachytes, alkali-rhyolites, a possibly nepheline-basanite. Lavas of the other unit a basalts, tholeiites, and quartz dolerites of tholeiit magma-type. The petrography of the rocks is brief described, and the distribution of the plateau lav summarized and figured. W. A. W.

Yagi (Kenzo). *Petrological note on the olivine trachybas from Wei-tschou Island, south China Sea.* Proc. 7 Pacific Science Congress (Auckland and Christchur meeting), 1953 (for 1949), **2**, 281–286.

The trachybasalt forming Wei-tschou Island, a shie volcano, is described and an analysis by the author give The petrography is briefly discussed. W. A. W.

AN (V. C.), CHANG (F. H.), & HSU (L. C.). *The gabbroic rocks of Hutoushan and Kuanshan, east Taiwan.* Proc. Geol. Soc. China [Formosa], 1959, no. 2 (for 1958), 5–31, 7 figs., 2 pls.

Gabbroic bodies intruded along a flexure zone have been idied chemically and petrographically. The mineral mposition of the gabbros shows simultaneous iron enrichnt in pyroxenes and olivines and sodium enrichment in e plagioclase. Three distinct stages of crystallization are scribed—an ultramafic, a gabbroic with a sub-stage of rnblende gabbro, and a stage which yielded bojite (a rnblende-gabbro rich in FeO). Sixteen chemical and odal analyses are tabulated. R. A. H.

NDO (T.). *Comparisons of chemical compositions between the granitic rocks of the Abukuma and Kitakami massifs, northeastern Honshu, Japan.* Sci. Rept. Tohoku Univ., ser. 3, 1959, **6**, 227–259, 15 figs.

The granitic rocks of these two areas are compared with ie aid of previously published chemical data for 116 rocks, r which the Niggli values are here tabulated. The rocks f the two massifs are considered to be chemically similar.

R. A. H.

OKI (KEN-ICHIRO). *Petrology of alkali rocks of the Iki Islands and Higashi-matsuura district, Japan.* Sci. Rept. Tohoku Univ., ser. 3, 1959, **6**, 261–311, 20 figs., 2 pls.

Alkali olivine basalt has proceeded by crystallization-ifferentiation to trachybasalt, trachyandesite, and achyte, but where assimilation of granitic rocks has ccurred at an intermediate stage it has brought about the roduction of kaersutite by reaction between clinopyroxene r olivine and the magma, giving rise to kaersutite-bearing rachybasalt, trachyandesite, trachyte, and alkali rhyolite. Where the alkali olivine basalt magma has assimilated ranitic rocks at an early stage, however, it gives rise to asalt–pyroxene andesite–hornblende andesite of the calc-lkali series. Abundant mineralogical, petrographical, and hemical data include 26 new rock analyses, and analyses f anorthoclase (A) (α : (001) 1°) from alkali rhyolite, Iadarashima ; lime anorthoclase (B) (α : (001) 0°–3°) from rachyte, Madarashima ; aluminous titanaugite (C) from a yroxene nodule in trachybasalt, Numazu, Gonoura-machi ; nd kaersutites (D) occurring as a phenocryst in scoria, akenotsuji, (E) from a cognate xenolith in trachyte, west f Kakujo-san, Gonoura-machi ; and (F) a phenocryst in rachyandesite, Yokouchi, Numasu, Gonoura-machi. Anal. by Geol. Surv. Japan, B and C by K. Aoki, and D, E, and by H. Matsumoto.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
A	66·65	—	20·47	0·45	—	—	0·07	0·68	7·17	4·23
B	63·35	0·08	21·28	0·80	—	—	0·06	2·41	7·38	4·35
C	48·11	1·14	7·26	3·13	4·86	0·11	14·04	20·46	0·66	0·04
D	39·15	7·55	13·67	7·11	5·05	0·14	11·29	11·65	3·41	0·59
E	39·68	7·12	12·81	4·04	8·79	0·16	11·22	11·06	3·37	1·04
F	40·36	7·09	13·78	3·39	7·91	0·14	11·08	10·82	2·78	1·34

	F	H_2O+	H_2O-	$O \equiv F$	Total	α	β	γ	2V	$\gamma : c$
A	—	—	—	—	99·72	1·524	1·530	1·530	45°(−)	—
B	—	0·14	0·18	—	'100·23'	1·531	1·538	1·540	61°(−)	—
C	—	0·33	0·10	—	100·24	—	1·700	—	51–53°(+)	48°
D	0·31	0·45	0·10	0·13	'100·25'	1·689	1·709–1·741	1·772	79½°(−)	0–5°
E	0·33	0·78	0·15	0·14	100·41	1·685	1·710–1·718	1·736	66–74°(−)	4°
F	0·37	0·79	0·26	0·16	'100·49'	1·688	1·708	1·720	78°(−)	4°

R. A. H.

SENDO (T.). *On the granitic rocks of Mt. Otakine and its adjacent districts in the Abukuma massif, Japan.* Sci. Rept. Tohoku Univ., ser. 3, 1958, **6**, 57–167, 24 figs., 13 pls.

The granitic rocks of the Mt. Otakine district are composed of quartz-diorite, granodiorite, and adamellite, three series being recognised by petrographic character and age of intrusion. Many modal analyses and 35 new chemical analyses are presented, together with trace element data. It is considered that contamination of basic rocks has played a leading role in the formation of the various members of this granitic series, and these rocks are compared with similar granitic rocks in the younger orogenic zones elsewhere in the world. R. A. H.

YAMAGUCHI (M.). *Petrography of the Otozan flow on Shoda-Shima Island, Seto-uchi Inland Sea, Japan.* Mem. Fac. Sci. Kyushu Univ., Ser. D, 1958, **6**, 217–238, 14 figs., 5 pls.

The Upper Miocene Otozan flow is layered and from the base upwards consists of augite-olivine-bytownite andesitic basalt, augite-bearing olivine-bronzite andesite, olivine-bronzite andesite, and bronzite andesite, which are gradational into each other. Modal and 10 chemical analyses are presented : magnesia and the alkali oxides are comparatively high for such rocks ; potassium-oligoclase (α 1·534, $2V\gamma$ 40°–60°) occurs in the groundmass of the bronzite andesite. Dispersed xenocrysts of plagioclase and quartz and sporadic inclusions of bronzite-biotite-alkali feldspar aggregates are also recorded. R. A. H.

STEPHENSON (P. J.). *The Mt. Barney central complex, S.E. Queensland.* Geol. Mag., 1959, **96**, 125–136, 1 fig.

A general description of the rock types and structures in a Tertiary igneous complex (area about 14 × 11 miles) within which are five centres of activity. A boss of biotite granophyre, ring-dykes of biotite- and pyroxene (pigeonite)-granophyres, dolerite cone-sheets, and a diorite body are briefly described, in addition to rhyolite sills, basic lavas,

and volcanic agglomerates. Close similarities to several features of the Scottish Tertiary volcanic centres are observed. G. M. B.

Tex (E. Den). *The geology of the Grey Mare Range in the Snowy Mountains of New South Wales.* Proc. Roy. Soc. Victoria, 1959, **71**, 1–24, 5 figs., 3 pls.

A metamorphic complex of alternating phyllites, schists, quartzites, granitic gneisses, migmatites, and pegmatites is penetrated by the Grey Mare granodiorite. The latter is variable in composition and has a leucocratic facies with muscovite and tourmaline ; later pegmatites with tourmaline or chlorite and epidote occur. The structural geology of the area is discussed in detail. R. A. H.

Hutton (C. Osborne). *Notes on the geology of Kapiti Island, Cook Strait, New Zealand. Part II. Petrography.* Trans. Roy. Soc. New Zealand, 1949, **77**, 465–468, 1 fig.

A fabric diagram for quartz in pre-Cretaceous phyllonite shows a strong preferred orientation. Sericite, prehnite, and rare pumpellyite and clinozoisite are among the products of neomineralization. D. S. C.

Hopgood (A. M.). *Spherulitic jaspilite from Whangarei Heads [New Zealand].* Trans. Roy. Soc. New Zealand, 1957, **85**, 131–134, 3 figs.

Spherulitic jaspilite occurs as small lenses closely associated with fine-grained spilitic rocks. Individual spherulites within the jaspilite exhibit both concentric and radial form, and show crowding of hematite and minute silica particles into concentric zones. The location of the jaspilite as xenoliths within spilite suggests that banded hematitic cherts caught up by the spilite have been partially dissolved and recrystallized to their present spherulitic form. W. A. W.

Steiner (A.). *Petrogenetic implications of the* 1954 *Ngauruhoe [New Zealand] lava and its xenoliths.* New Zealand Journ. Geol. Geophys., 1958, **1**, 325–363, 21 figs.

The 1954 Ngauruhoe lava is an olivine-bearing basaltic andesite, and contains numerous small quartzose and feldspathic xenoliths and intensely vitrified xenoliths of boulder size. Structural, petrographic, and chemical data indicate that the xenoliths are derived from acidic gneiss. Limited miscibility between acid syntectic melt and basic host magma is suggested by gradational contact of the vitrified xenoliths. The lava forms part of the Taupo volcanic association (Pliocene to Recent) which extends over much of the central part of the North Island. Basalts, basaltic andesites, pyroxene-andesites, dacites, rhyolites, and ignimbrites are the characteristic rocks. Three distinct series are recognized: (*a*) a main basic series ranging fr basalt to dacite, (*b*) an acid series of rhyolites and nimbrites, and (*c*) an accumulative series of basa and basaltic andesites. Many chemical analyses given. Petrochemical study indicates that, exce for the accumulative series, the sum of the all luminous oxides ($Al_2O_3+Na_2O+K_2O$) remains consta during magmatic differentiation. This constancy is one the characteristics distinguishing the Taupo volcanics fr the Hawaiian basalt–trachyte association. The pare magma of the main basic series has been derived fr olivine-basalt magma by selective assimilation of aci gneiss. Limited fractional crystallization of this co taminated magma, controlled by the constancy of the su of the alkaluminous oxides, produces the lavas of the basal dacite series. The accumulative basic lavas have form from the uncontaminated olivine basalt magma by gravit tional crystal accumulation and limited fractional crystal zation. The similarity in chemical composition between t vitrified xenoliths and the rhyolites and ignimbrites su gests that the Taupo acid effusives originated from an ac magma produced by transfusion of acidic gneiss in pr longed contact with olivine basalt magma at great dept Fractional crystallization of the acid series is also restrict by the constancy of the sum of the alkaluminous oxides. W. A. W.

Belin (R. E.) & Steiner (A.). *Some observations on t radioactivity of Ngauruhoe and White Island lavas.* Ne Zealand Journ. Geol. Geophys., 1959, **2**, 177–182.

Radioactivity measurements on Ngauruhoe lavas various ages, and on xenoliths found in the September, 19 Ngauruhoe flow [see preceding abstract] are recorded. T variation in count rates of the 1954 Ngauruhoe lavas is d to the presence or absence of a varying amount of sm feldspathic xenoliths. The radioactivity is roughly pr portional to the potash content. The recent lavas on t White Island volcano, Bay of Plenty, are more radioacti than the older lavas. Brief experimental details are give W. A. W.

O'Shea (B. E.). *Petrography of the Whakapapanui Gor andesites, Mount Ruapehu [New Zealand].* Ne Zealand Journ. Geol. Geophys., 1959, **2**, 412–42 7 figs.

Lava flows, all augite-hypersthene andesites, of tw recent eruptive cycles were examined. Brief petrograph and mineralogical data are given. W. A. W.

Martin (R. C.). *Some field and petrographic features American and New Zealand ignimbrites.* New Zealan Journ. Geol. Geophys., 1959, **2**, 394–411, 10 figs.

The origin, terminology, and lithology of ignimbrites a

efly discussed. Lithological variation in these rocks is at, and even in a single sheet gradations from tuff to rd vitrophyre and felsitic rocks are common. These adations form a consistent pattern in the ignimbrites adied. They are illustrated in vertical sections and interted as being due to differences in cooling environment. trographic character, the occurrence of autopneumatois, and the feature of abundant lenticles in some ignimtes are briefly discussed. Field relations are described, d a brief comparison between ignimbrites of New Zealand d western North America is made. W. A. W.

EINER (A.), BROWN (D. A.), & WHITE (A. J. R.). *Occurrence of ignimbrite in the Shag Valley, north-east Otago.* New Zealand Journ. Geol. Geophys., 1959, **2**, 380–384.

The paper records the occurrence of ignimbrite (formerly scribed as a quartz-porphyry) interbedded with upper nonian coal measures. Brief petrographic and chemical ta are given. W. A. W.

EBB (P. N.) & MCKELVEY (B. C.). *Geological investigations in South Victoria Land, Antarctica. Part I—Geology of Victoria dry valley.* New Zealand Journ. Geol. Geophys., 1959, **2**, 120–136, 13 figs.

Basement rocks exposed in the Victoria dry valley [about t. 77°20′S., long. 161°–161°30′E.] consist of thick uniform eets of granite separated by younger dolerite sills. amprophyre and pegmatite dykes antedating the sills cur within the granite basement. Brief petrographic tails of the granite, lamprophyre, pegmatite, and dolerite e given. W. A. W.

Petrology : structural, petrogenetic

OODSPEED (G. E.). *Some textural features of magmatic and metasomatic rocks.* Amer. Min., 1959, **44**, 211–250, 12 figs.

Textural features are described which aid in determining hether a rock body was derived by orderly crystallization f a magma or by the transformation of pre-existing aterial. If textural features record only the final stages f crystallization then detailed field study is most impornt. Textural differences between orthomagmatic and te magmatic or deuteric crystallizations are indicated. xamples are given from the basaltic and diabasic dikes ear Cornucopia, Oregon, and from the shonkinite–granite orphyry sequence at Yogo Peak in the Little Belt Mountains, Montana. The textural features of metasomatic ocks are contrasted; development of porphyroblasts, lomeroblastic aggregates, and crystalloblastic pattern, xamples being cited from rocks from Cornucopia, Oregon, nd Buffalo Hump, Idaho. Finally, the case of superposed textures is discussed with rheomorphic dikes or breccias cited as examples of mobilization of metasomatized rocks. The use of thin sections of large area helps particularly in the interpretation of metasomatic textural features. B. H. B.

BROTHERS (R. N.). *Flow orientation of olivine.* Amer. Journ. Sci., 1959, **257**, 574–584, 18 figs.

Petrofabric analyses of olivine in six rocks (peridotites, basic plutons, and intrusive basalts) which show mineral orientation show that {010}, the dominant crystal form in most tabular grains, is usually the controlling factor in preferred orientations due to fluid flow. Shear on (010) is the controlling factor in fabrics modified by deformation of solid rock, but the result does not necessarily differ from a fabric developed by flow. The commonest pattern shows concentration of the optical directions $\alpha(=b)$, normal to a girdle containing β and γ; the latter may show subordinate maxima in the girdle. In rare cases unusual development of some other face, as (110), changes this picture accordingly. H. W.

NICKELSEN (RICHARD P.) & GROSS (GERARDO W.). *Petrofabric study of Conestoga limestone from Hanover, Pennsylvania.* Amer. Journ. Sci., 1959, **257**, 276–286, 14 figs.

Preferred orientation of calcite crystals in a slightly deformed rock is interpreted in terms of several episodes of deformation. H. W.

TEX (E. DEN). *Studies in comparative petrofabric analysis : The Broken Hill lode and its immediate wall rock.* Australasian Inst. Mining & Metall., 1959, Stilwell Anniv. vol., 77–104, 8 figs.

Comparative studies of the pole of the basal cleavage of biotites, and of the optic axis, poles to fracture planes approximately parallel to the optic axis, and the mutual intersections of the fracture planes in quartz crystals, have shown that the gangue quartz of the Broken Hill ore body crystallized after the deformation and metamorphism which affected the wall rocks. [M.A. **11**–507] R. A. H.

[SOKOLOV (YU. M.)] Соколов (Ю. М.). Некоторые вопросы распределения слюд и других минералов в пегматитовых жилах Чуйского месторождения мусковита. [*Some questions about the distribution of mica and other minerals in pegmatite veins from the Chuysky muscovite deposit.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc]., 1959, **88**(2), 191–196, 4 figs.

A petrofabric analysis of minerals in pegmatites shows that mica crystals are orientated with respect to the longitudinal and transverse joints of pegmatite veins and to the bedding plane of the country rocks. S. I. T.

Wager (L. R.). *Differing powers of crystal nucleation as a factor producing diversity in layered intrusions.* Geol. Mag., 1959, **96**, 75–80, 1 fig.

A type of rhythmic unit found in the Bushveld intrusion, and certain other layered intrusions, is described. A hypothesis is presented to explain the sequence of minerals accumulated as discrete crystals to form a unit, and the rhythmic repetition of units. It is suggested that chromite, bronzite, and bytownite nucleated from a supersaturated magma in an order corresponding to the increasing complexity of their crystal structures. G. M. B.

Ruckmick (John C.) & Noble (James A.). *Origin of the ultramafic complex at Union Bay, south-eastern Alaska.* Bull. Geol. Soc. America, 1959, **70**, 981–1018, 5 figs., 4 pls.

This ultramafic complex is an exceptionally well-exposed example of a series of similar complexes forming a belt parallel to the Coast batholith. A body of gabbro, approx. circular about 6 miles diameter, intrudes folded sedimentary rocks of probable Triassic and Cretaceous age, the low grade of regional metamorphism in which is increased to almandine-zone grade adjacent to the contact. Intrusive into the gabbro is an ultramafic complex comprising a vertical pipe, approx. 1 mile diameter, and a lopolithic offshoot 5 miles long and 3 miles wide. The ultramafic rock ranges through hornblende-pyroxenite, pyroxenite, olivine-pyroxenite, peridotite, and dunite. Both the pipe and the lopolith show a well-developed concentric zoning with dunite in the centre and pyroxenite or hornblende-pyroxenite on the periphery. Modal and gravimetric analyses are given for 4 specimens of country rock and 11 samples of the igneous rocks ; gravimetric analyses and optical data for 3 pyroxenes, and a gravimetric analysis for a hornblende. Optical determinations of the composition of coexisting pyroxenes and olivines from the various units indicate that the pyroxene is considerably more magnesian than the olivine. The complex is believed to have formed by a succession of magmatic intrusions of different compositions. The composition and distribution of the intermediate members is explained by minor mixing and melting. Lack of contact metamorphism of a grade that might be expected from intrusions of such high temperature is explained by the ultramafic rocks being almost everywhere in contact with gabbro, not sedimentary rocks, and by the suggestion that the ultramafic magmas, because of their anhydrous nature, absorbed, rather than expelled, volatiles. A. L. A.

Poldervaart (Arie) & Taubeneck (William H.). *Layered intrusions of Willow Lake type.* Bull. Geol. Soc. America, 1959, **70**, 1395–1398.

The writers propose a subdivision of rhythmic layering into : (1) Skaergaard type, the type locality of which is Skaergaard pluton of East Greenland ; and (2) Willow La type, in the Elkhorn Mountains of northeastern Oreg Skaergaard type layering is attributed to crystal se mentation under the influence of gravity and perio disturbances in the magma. Crystals of the constitu minerals characteristically show a preferred orientation their longer axes in the plane of layering. Willow Lake t layering is attributed to undercooling and crystallizatio the oversaturated region, combined with periodic distu ances in the magma. Crystals of the constituent mine characteristically are elongated, curved, and branching a are oriented with their longer axes at high angles to layering. A. L. A

Worst (B. G.). *The differentiation and structure of the Gr Dyke of Southern Rhodesia.* Trans. Geol. Soc. S. Afri 1958, **61**, 283–354, 9 pls., 6 figs. Discussion a author's replies, pp. 355–358.

This paper represents a major contribution to knowled of one of the most remarkable layered basic and ultraba intrusions in the earth's crust. Detailed structural, pet graphic, and mineralogical data from surface exposures a boreholes are supplemented by excellent illustrations a 49 new chemical analyses of rocks and minerals. Structu and petrogenetic interpretations are discussed with gr clarity and comparisons drawn with other layered ba complexes. It is concluded that the Great Dyke compri the remnants of four layered fractionated basic lopoli preserved in a graben. Each complex exhibits rhythmica repeated zoning of dunite, harzburgite, and pyroxen layers and each is capped by gabbroic rocks.

E. S. W. S

Coertze (F. J.). *Intrusive relationships and ore-deposits the western part of the Bushveld Igneous Compl* Trans. Geol. Soc. S. Africa, 1958, **61**, 388–392, 1 Discussion and author's replies, pp. 393–400.

Detailed investigation north of the Pilanesberg sho that each of the constituent rock-types of the basic port of the Bushveld Complex (pyroxenite with chromite sea anorthosite, norite, porphyritic pyroxenite, pegmat pyroxenite, gabbro, ferrogabbro, dunite, and magnet represents a separate intrusion. Breaks in the platinifer and chromiferous rocks are shown to be the result of tra gression of the uppermost ferrogabbro across the wh succession in two localities. E. S. W. S

Reynolds (Doris L.). *Calderas and ring-complexes.* K Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 19 **16** (Gedenkboek H.A. Brouwer), 355–379, 1 fig.

The problems of calderas and cauldrons are discussed

ms of the form of the fault-planes bounding them, the se of the subsidence resulting in caldera formation, the s-coring hypothesis and its implications, the collapsed me hypothesis, and the metamorphism of down-faulted lcanic rocks. The lack of knowledge of the dips of ring-ctures and ring-dykes in Ardnamurchan and Mull is phasized : inward dipping ring-faults are recognised in ven cauldrons and in the Skaergaard 'caldera'. The space oblem of the Skaergaard complex is considered and rious possible criteria are suggested to show whether the bbros might be transformation products of basaltic tuffs d flows. R. A. H.

AFEBER (DAVID). *Columnar jointing and intracolumnar differentiation in basaltic rocks.* Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwer), 241–251, 2 figs., 4 pls.

A characteristic zonal arrangement of plagioclase, pheline, and analcite in basaltic columns from the Upper umut area of New South Wales, Australia, showing the enomenon of spontaneous cracking is explained as a result intracolumnar differentiation. The columnar structure is terpreted in terms of the development of vertical, local nvection currents. Four chemical analyses are reported r the nepheline-basanites of the Eight Mile and Beacon ill basalts of the Upper Tumut area. R. A. H.

ARTYANOV (N. N.)] Мартьянов (Н. Н.). К происхождению овальных форм гранитных пегматитов. [*On the origin of the oval shapes of granite pegmatites.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci. U.S.S.R.], 1959, **125**, 1337–1340.

Study of Siberian pegmatites and consideration of the terature on pegmatites suggest that the bulging type of gmatite veins must have been formed from comparatively uid pegmatite melts greatly enriched in mineralizers. S. I. T.

UDDINGTON (A. F.). *Granite emplacement with special reference to North America.* Bull. Geol. Soc. America, 1959, **70**, 671–747, 19 figs.

Publications of the last 25 years which discuss the mplacement of granite plutons are summarized and viewed with special reference to North America. The lutons are classified according to emplacement in the pizone, mesozone, or catazone of the earth's crust. It is ncluded that those emplaced in the epizone are almost holly discordant ; those in the mesozone are in part dis-ordant and in part concordant ; and those in the catazone redominantly concordant. Granite formed by granitiza-ion is considered to be minor or local in plutons of the pizone, common, but subordinate in those of the mesozone, and dominant in plutons of the catazone. However, it is inferred by most of the authors of the papers reviewed that magma was either directly or indirectly the main source of granite in all the zones. The review emphasizes the great number and great total volume of granitic plutons emplaced as fluid magma in the epizone and their community of origin with lavas of similar composition directly associated in time and space ; magma is thus inferred to play the major role in Tertiary stocks and batholiths. There appears to be no discontinuity between plutons of the epizone and those of the mesozone, and a major role for magma is indicated for the latter also. The evidence is not clear as to whether plutons of the mesozone are continuous with those of the catazone, have roots in the catazone, or are pinched off from it. Batholiths emplaced in the mesozone are dominant in most basement complexes of Precambrian or of early Cretaceous age. A. L. A.

SAHA (AJIT KUMAR). *Emplacement of three granitic plutons in southeastern Ontario, Canada.* Bull. Geol. Soc. America, 1959, **70**, 1293–1326, 21 figs.

The emplacement of three post-tectonic granitic plutons in Hastings and Peterborough counties, Ontario, was studied by lithological and structural mapping, petrographic study including modal and chemical analyses, and radiometric, decrepitometric and petrofabric studies. Seven chemical and modal analyses of rocks from the plutons are given. The country rocks consist of Grenville metasedimentary rocks which were folded in two stages along N.E.-S.W. and E.S.E.-W.N.W. axes respectively before emplacement of the plutons. Many features are described which support the conclusion that the plutons resulted from forceful emplacement. Two of the plutons show unsystematic variations of modal minerals and α activity suggesting that varied rock types were assimilated by the magma. One pluton shows systematic trends which suggest that magmatic differentiation occurred. The cooling of the plutonic rocks was accompanied by extensive recrystallization of quartz in all three plutons, formation of myrmekite and of albite rims in two of the plutons, and segregation of albite from the perthites in the other pluton. A. L. A.

DUPLAN (LOUIS). *Les granites de l'Eg'éré (Hoggar).* C.R. Acad. Sci. Paris, 1957, **245**, 98–101.

Among the granites of Hoggar [Algeria] can be distinguished several types ranging from more ancient to more recent. 1—the late-migmatitic granites, with microcline, plagioclase, and biotite, of Foum Haraou, Tin Hammane, and Ti-N-Tarha ; 2—the syntectonic granite, often with enclaves of amphibolite, of Tirsine ; 3—the post-tectonic granite, with hornblende and biotite and enclaves of microdiorite of In Ebeggui. These granitic occurrences correspond to the major phenomena which control the geology of this chain. E. J. & A. S.

Barbeau (Jacques) & Gèze (Bernard). *Les coupoles granitiques et rhyolitiques de la région de Fort-Lamy (Tchad).* Bull. Soc. géol. France, 1957, **7**, 341–351, 3 figs., 3 pls.

A description of some rocks emerging from the quaternary plain of Tchad. East of Fort-Lamy most show (from bottom to top) a cupola-zone of the normal granite with biotite, then a columnar zone with interstitial material corresponding to aegirine-rhyolite, surmounted by balls of granite isolated in rhyolite or even rhyolite alone. North-west of Fort-Lamy other outcrops present the same structure of cupolas surmounted by columns but are almost wholly rhyolitic ; among them is one which certainly corresponds to the upper part of a volcano. Hypotheses of the conditions of emplacement and of the age of the rocks are discussed. E. J. & A. S.

Rémy (Jean-Marcel). *Les massifs éruptifs du Sud-Est de l'Amadror en Ahaggar (Sahara Central).* C.R. Acad. Sci. Paris, 1957, **244**, 2820–2822.

A description of the volcanism of middle Cretaceous age in the central Sahara. Complex structures formed by granular rocks and lavas, and ring-dyke structures are found. [Abstract by J. Rémy] E. J.

Pitcher (W. S.) & Read (H. H.), with Cheesman (R. L.), Pande (I. C.), & Tozer (C. F.). *The main Donegal granite.* Quart. Journ. Geol. Soc. London, 1958, **114**, 259–305, 15 figs., 4 pls.

The local Dalradian succession, into which the granodiorite (30 miles long and about 5 miles wide) is intruded is described and the contact metamorphism is summarized. The aureole contains staurolite and kyanite besides the more usual contact minerals. The petrography of the main granodiorite is given and the internal structure of the igneous mass described in detail. Steep flow banding with N.E. strike along the length of the intrusion is predominant. The contact-zones show deformation which suggest movement of the magma in a N.E.-S.W. horizontal direction, accompanied by conversion of the contact rocks into schists. 'Free-swimming rafts' of country rock abundant within the intrusion occur as platelike bodies lying parallel to the planar flow structures. Lack of arching of adjacent strata and the evidence mentioned are held to indicate that lateral magmatic stoping and dilation form the mode of emplacement of this major magmatic body. R. St J. L.

Bott (M. H. P.). *A geophysical study of the granite problem.* Quart. Journ. Geol. Soc. London, 1956, **112**, 45–68, 2 pls., 8 figs.

A series of gravity anomaly profiles over known granites are compared with possible models. Geophysical evidence opposes the idea of underlying basic masses while gene geochemical considerations oppose an origin from fusion sedimentary or metamorphic rocks. An hypothesis derivation from a granitic layer is preferred. R. St J. L

Saha (Ajit Kumar). *Mineralogical and chemical variati in the Wollaston granitic pluton, Hastings Coun Ontario.* Amer. Journ. Sci., 1958, **256**, 609–619, 4 fi

The pluton (6 × 1¼ miles) of foliated biotite-hornbler granite exhibits general (more siliceous and less mafic sou to north) and marginal variations. Everywhere about 1 yards from the margin quartz and plagioclase, which ten to be more sodic, increase, the proportion of mafics and t ratios Kf to Pl and hornblende to biotite decrease, the char growing towards the border. Similar variations occ against a roof pendant and at the border of an off-shooti dike. The changes in biotite paragneiss near contact with granite dike are generally the reverse of those in the grani The general variation from south to north is attributed movement of the magma from south to north, the margi variations to diffusion of silica and soda in aqueous soluti from heated paragneiss into the adjacent magma at an ea stage of crystallization. It is considered possible that t process could account for 'basic fronts' but would inoperative if the magma became saturated with water. this event later stages might obliterate the effects of bas cation. One new chemical and seven modal analyses given. J. T. L

Foster (Robert J.). *The Teanaway dike swarm of Cent Washington.* Amer. Journ. Sci., 1958, **256**, 644–6 3 figs.

The thousands of dikes in the Teanaway swarm, a f inches to over 160 feet thick and several miles in length, between 80° W. and the vertical, and trend generally N. 15° in an E.-W. belt 45 miles long and 5–10 miles wide. T ratio of intrusive to sedimentary rock averages one to f and in places the dikes form more than 90% of bedro The dike swarm is composed of tholeiitic basalt, related the Columbia River basalt, with intersertal texture and average of 50% zoned plagioclase (An_{30}–An_{50}), 30 pyroxe (pigeonite and augite), 15 glass, mineraloids, and chlor material, and 5 opaques. It is postulated that the dikes not the source of the overlying Teanaway basalt, that th emplacement was controlled by folding in the older Swa arkose, and that the source was an elongate body of mag below the location of the swarm. J. T. L

Barrabé (Louis) & Deicha (Georges). *Reanimation magmas et interprétation de quelques particularités leurs éléments de première consolidation.* Bull. S géol. France, 1957, **7**, 150–169.

Fusion experiments on the glass inclusions in the quartz f effusive rocks may lead to interesting petrogenetic con- lusions ; on the one hand, on the manner of their formation nd on their possible use as thermometers, on the other and on the mechanical effect they may exercise on the ost crystal. The decrepitation of the inclusions in quartz from Guadeloupe) heated to fully 900°C may be due to xpansion of the magmatic contents or to contraction on the ransformation of the quartz during cooling.

E. J. & A. S.

Mitich (G. V.)] Митич (Г. В.). Ксенолиты кварцитов и селективность гранитизации в юго-западной части Алданского кристаллического массива. [*Quartzite xenoliths and granitization selectivity in the south-western part of the Aldan crystalline massif.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull Acad. Sci. U.S.S.R., Geol. Ser.], 1958, no. 12, 94–100, 1 fig.

Careful mapping of the pre-Cambrian rocks of Aldan Massif in Siberia revealed a striking granitization selectivity, namely the activity of crystalline schists transformed into granite-gneiss and the passivity of quartzites, numerous relics of which are found in the form of xenoliths. S. I. T.

Tikhomirov (V. V.)] Тихомиров (В. В.). К вопросу о развитии земной коры и природе гранита. [*On the problem of the development of the earth's crust and on the nature of granite.*] Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 1958, no. 8, 3–15.

Because of the absence of acid rocks among meteorites, it is suggested that granites are specific formations developed during a definite stage in the development of the earth. It is suggested that granitization, as a result of metasomatism, occurs only in the zones of elevation, while in the zones of sinking sial is basified without the intervention of either temperature or pressure. In the history of the earth both sial and granites are temporary phenomena. S. I. T.

Jung (Jean). *Le problem de la durbachite dans les Vosges d'Alsace.* Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H.A. Brouwer), 176–183, 2 figs., 2 pls.

Durbachite, of syenitic composition and gneissose appearance, from near St. Croix-aux Mines, central Vosges, is considered to represent the local preservation of a basic front in a metasomatic sequence associated with the Crêtes granite. [M.A. **14**–223] R. A. H.

Harrington (H. J.). *Size and abundance of phenocrysts in lavas of terrestrial and geosynclinal environments.* Nature, 1957, **179**, 271.

Conditions for the formation of large phenocrysts in a magma are most favourable where its movement is towards a terrestrial surface, less so where towards a geosynclinal shelf surface and least when towards a surface in the deeper parts of a geosynclinal trough. C. H. K.

Sørensen (Henning). *The Ilímaussaq batholith (South West Greenland), a review and discussion.* Medd. om Grønland. 1958, **162**, no. 3, 1–48, 18 figs. [Also in Grønlands Geol. Unders. Bull. no. 19.].

The paper is a summary of the present knowledge of the geology of the Ilímaussaq batholith. Comparisons are made with numerous other nepheline-syenites. A magmatic as well as a metasomatic genesis are discussed ; a combination of both kinds of processes is in best agreement with the observations. [M.A. **14**–219, 372] H. M.

Kuno (Hisashi). *Origin of Cenozoic petrographic provinces of Japan and surrounding areas.* Bull. Volcanologique, 1959, ser. 2, **20**, 37–76, 12 figs.

Three petrographic provinces are recognised : a tholeiite series on the Pacific side of the Japanese Islands, an alkaline series occupying the Japan Sea side of the Islands with an off-shoot across central Honshu and a continuation westwards to Korea and Manchuria, and a calc-alkali series superimposed on the previous two and occupying the greater part of the Japanese Islands. The boundary between the tholeiite and alkali provinces lies close to that between areas where earthquakes occur at depths shallower than about 200 km and areas of deeper ones. It is suggested that the parental tholeiite magma is produced by partial melting of the peridotite layer at depths shallower than 200 km and that the parental alkali olivine basalt magma is formed by partial melting of the peridotite layer at depths greater than 200 km. In the Tertiary orogenic belt of the Japanese Islands both types of parental magma assimilate granitic material during passage to the surface and erupt to form volcanoes of the calc-alkali series. Two new chemical analyses of basalt are presented. [M.A. **11**–204, 394] R. A. H.

Hamilton (J.). *Mineralogy of basalts from the western Kilpatrick Hills and its bearing on the petrogenesis of Scottish Carboniferous olivine-basalts.* Trans. Edinburgh Geol. Soc., 1956, **16**, 280–298.

Optical data for the pyroxenes, olivines, and plagioclases of the basalts are given and the textural and mineralogical features of the rocks discussed. Two hypotheses—that the various types of basalt have been produced by the differentiation of a parent basaltic magma, and that the various types of basalt have been produced by the selective fusion of gabbroic rocks in depth—are considered. As the first hypothesis cannot account for mineralogical and textural anomalies in the basalts, readily explicable by the second hypothesis, the latter is preferred. G. P. B.

Jung (J.) & Brousse (R.). *Précisions nouvelles sur la constitution et sur l'origine des associations volcaniques.* Bull. Soc. franç. Min. Crist., 1958, **81**, 133–141, 8 figs.

Diagrams showing the variation in the ratios K+Na/K+Na+Ca and K/K+Na as a function of the Si content of volcanic rocks are used to illustrate the various types of volcanic associations. The problems of the petrogenesis and distribution of these rocks types are discussed. R. A. H.

Denaeyer (M. E.). *Les syénites métasomatiques de Kirumba (Kivu) et le caractère potassique des laves des Virunga.* C.R. Acad. Sci. Paris, 1957, **245**, 1448–1451.

—— *Les syénites feldspathoïdiques du Kivu et leur rôle dans la genèse des laves des Virunga.* Bull. Soc. belge Géol., 1958, **67**, 459–481, 4 figs., 3 pls.

Soda metasomatism of Urunduian mica-schists and their desilication by a carbonatite have produced feldspathoid syenites with radioactive minerals at Kirumba, of relatively recent age. Liberation of potassium in the course of these reactions satisfactorily explains the special characters of the Virunga lavas. Anals. by M-elle J. Heirwegh : (A) muscovite-schist, (B) two-mica-syenite, (C) biotite-syenite, (D) nepheline-syenite with sodalite and cancrinite, (E) lujaurite.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O+	H_2O-	TiO_2	Total
A	48·03	27·70	6·24	0·41	nil	1·28	tr.	8·92	5·31	0·97	1·14	100·13
B	55·59	23·97	1·09	1·92	2·68	2·17	3·08	7·70	0·37	0·21	0·31	99·31
C	54·13	15·97	6·43	4·66	tr.	2·38	9·53	2·32	1·20	0·15	0·95	99·34
D	55·68	19·70	1·56	1·01	tr.	2·58	11·26	4·64	0·17	0·11	0·32	'99·99'
E	59·05	14·95	6·95	1·18	0·51	2·27	9·16	5·04	0·86	0·16	0·20	100·75

Totals include : A, MnO tr., P_2O_5 0·03, CO_2 0·10 ; B, MnO tr., P_2O_5 tr., CO_2 0·10, B_2O_3 0·12 ; C, MnO 0·64, P_2O_5 tr., CO_2 0·98 ; D, MnO 0·17, P_2O_5 tr., CO_2 1·26, Cl_2 0·49, SO_3 0·34 ; E, MnO 0·22, P_2O_5 nil, CO_2 0·17, Cl_2 0·03.

E. J., A. S., & F. Sch.

Campbell Smith (W.). *A review of some problems of African carbonatites.* Quart. Journ. Geol. Soc. London, 1956, **112**, 189–220, 2 figs.

An extensive survey of African carbonatites is given with comparisons with the Alnö and Fen complexes and mention of others from N. America and Russia. The complexes principally reviewed are Kerimasi and Panda Hill (Mbeya) from Tanganyika ; Napak, Tororo, Bukusu and Sukulu from Uganda ; Chilwa Island and Kangankunde from Nyasaland ; Shawa, Dorowa and Chishanya from S. Rhodesia and Spitzkop and Palaboro from the Transvaal. Their mineral composition and general geochemistry is given ; the presence of rare-earth elements and minerals and the high concentrations of Ba and Sr are emphasized. The composition and structure of each complex mentioned above are summarised and the mode of emplacement discussed. A simple hydrothermal origin is dismissed and replacement features are thought to be of only local importance. Th carbonatitic magmatic liquid of von Eckermann [M.A **11**–27] accounts for the majority of the features of the dyk and the main carbonatite masses. The associated igneou rocks are dominantly of pyroxenite and ijolite type, whil nepheline-syenite is subordinate. Fenitization is discusse and its characteristic association with carbonatites emph sised. Theories of origin of the carbonatites are considere and the theory of origin from an ultrabasic magma rich i CO_2 is favoured. [M.A. **2**–165, **13**–525] R. St J. L.

[Volotovskaia (N. A.) & Kukharenko (A. A.)] Волотовска (Н. А.) и Кухаренко (А. А.). О типах карбонатитовы месторождений и их связи с массивами ультраосновны щелочных пород. [*On the types of carbonatite deposi and their relation to masses of ultrabasic-alkaline rocks* Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sc U.S.S.R., Geol. Ser.], 1959, no. 3, 110–112.

Criticism of Borodin's hypothesis of the origin c nepheline-pyroxene rocks as due to the nephelinization c pyroxenites [M.A. **13**–667], is supported by observation c the field relations of melteigites and ijolites in the Kol peninsula to pyroxenites and other rocks. The criticism i extended to other points of Borodin's article. S. I. T.

[Serba (B. I.)] Серба (Б. И.). Некоторые замечания к стат Л. С. Бородина «О типах карбонатитовых месторожден и их связи с массивами ультраосновных-щелочны пород». [*A few notes on L. S. Borodin's article 'On th types of carbonatite deposits and their relation to massi of ultrabasic-alkaline rocks'.*] Изв. Акад. Наук СССР Сер. Геол. [Bull. Acad. Sci. U.S.S.R., Geol. Ser.], 195 no. 3, 113–114.

This article is a strong criticism of Borodin's hypothesi that carbonatites are a byproduct of nephelinization c ultrabasic rocks [M.A. **13**–667]. One of the argument against this hypothesis is the high volume relation c carbonatites to the alkaline rocks in the well know occurrences. S. I. T.

[Merenkov (B. Y.)] Меренков (Б. Я.). Реликтопсевдоморф ные структуры ультраосновных пород и продуктов и изменения. [*Relict-pseudomorphic structures of ultraba rocks and of the products of their alteration.*] Труд института геологии рудных месторождений, петрогра фии, минералогии и геохимии. [Trans. Inst. Geol. c Ore-deposits, Petr. Min. & Geochem.], 1957, 17, 57–8 23 figs.

A survey of textural types found in ultrabasic rocks given, together with their detailed analyses and genet bearings. S. I. T.

TOPOGRAPHICAL MINERALOGY

LAITAKARI (AARNE). *Outokumpu, a generous source for minerals, specially noted for its chrome minerals.* Rocks and Minerals, 1959, **34**, 403.

The chromium minerals associated with the ores (chiefly chalcopyrite, sphalerite, pyrite, and magnetite) of the Outokumpu Copper Mine of Finland are chromite, fuchsite, chrome-diopside, chrome-tremolite, picotite, kämmererite, uvarovite, tawmawite, and eskolaite. Brief comments are given on each of these minerals. R. S. M.

KNORRING (O. VON) & DEARNLEY (R.). *Niobium–zirconium–thorium–uranium and rare-earth minerals from the pegmatites of South Harris, Outer Hebrides.* Nature, 1959, **183**, 255–6.

Minerals reported include columbite (≈ 60% Nb_2O_3), uraninite, thorite, kasolite, betafite, monazite, uranophane, allanite, and gahnite. M. J. Le B.

SMITH (W. E.). *Pyrite nodules in the Hythe Beds of the Tilburstow Hill area, Surrey.* Proc. Geol. Assoc., 1957, **68**, 45–52, 2 pls.

Partial alteration of pyrite nodules, formed by local cementation of the Hythe Sands (Cretaceous) has resulted in the development of limonite in association with fractured quartz grains, marginally, and limonite- or selenite-bearing veins, in the cores. A mechanism involving the formation of melanterite (hydrous ferrous sulphate) is suggested to explain these features. Complete alteration of the nodules has resulted in the formation of hollow ferruginous concretions (boxstones). W. J. W.

FOWLER (A.). *Minerals in the Permian and Trias of north-east England.* Proc. Geol. Assoc., 1956, **67**, 251–265, 2 pls., 2 figs.

The occurrence of fluorite, baryte, calcite, galena, and sphalerite, with subsidiary celestine, pyrite, limonite, dickite, and collophane, in the Magnesian Limestone of south Durham is related to the general Pennine mineralization, for which a Tertiary age is tentatively suggested. W. J. W.

MONSEUR (G.). *Présence de fluorine à Engihoul (Province de Liège, Belgique).* Ann. Soc. géol. Belgique, 1958–59, **82**, B 97–102, 1 fig., 2 photos.

A newly recorded deposit of green and violet fluorite in cubes and massive. J. M.

GEFFROY (J.). *Le berthiérite du gisement aurifère du Châtelet (Creuse).* Bull. Soc. franç. Min. Crist., 1958, **81**, 162, 1 fig.

Berthierite occurs in felted masses of crystals up to 1 × 0·2 cm in quartz geodes and in veins with stibnite, pyrite, arsenopyrite, löllingite, and later carbonates. R. A. H.

DURAND (G.). *Contribution à l'étude du gîte de vanadinite d'Herival.* Bull. Soc. franç. Min. Crist., 1959, **82**, 61–63.

The presence of montmorillonite and galena in a vanadinite-bearing vein in the Vosges [M.A. **5**–335] is taken to suggest that the alteration of galena released Pb^{2+} ions which were adsorbed by the montmorillonite, while stream waters carried in Cl^- and humic colloids which had already adsorbed VO_4^{3-} ions, leading to the formation of vanadinite, $(VO_4)_3Pb_5Cl$, in the clay. Vanadinite has been produced synthetically by a similar method [M.A. **14**–336]. R. A. H.

COPPENS (RENÉ) & SEN HUSSEIN (HUSSEIN ABDEL MO). *Sur la présence d'une minéralisation uranifère dans deux carrières de la région de Vigneux (Loire Atlantique).* C.R. Acad. Sci. Paris, 1957, **245**, 1818–1820.

A small occurrence of uranium, sometimes poorly crystallized as autunite is reported. E. J. & A. S.

GUITARD (G.) & PIERROT (R.). *Sur la présence d'eulytite et de mixite dans la minéralisation bismuthifère du Pic de Costabonne (Pyrénées Orientales).* Bull. Soc. franç. Min. Crist., 1957, **80**, 229–231. E. J. & A. S.

HECHT (FRIEDRICH), KÜPPER (HEINRICH), & PETRASCHECK (WALTER E.). *Preliminary remarks on the determination of uranium in Austrian springs and rocks.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 158–160, 1 map, 6 tables.

Figures are given for U in waters from Burgenland, Waldviertel, Styria, and Baden, the highest values being recorded from brines of the Vienna basin (up to 60 p.p.b. [μg/litre]), the gneisses of Ober-Inntal (38 p.p.b.), Mayrhofen, and Gastein (10–22 p.p.m.[p.p.b.?]), and the upper Carboniferous coal area at Nösslach (21 p.p.b.). Upper Tertiary lignite at Trimmelkam is locally uraniferous. The phosphorites in Vorarlberg are below the economic limit for U. J. D. P.

JEDLICKA (JOHN F.). *Report on Azegour, Morocco.* Rocks and Minerals, 1959, **34**, 119–120.

Azegour is located about 190 miles south of Casablanca. Palaeozoic schists, limestones, and volcanics are intruded by granite. Mineralization is in metamorphosed limestones which now consist of garnet and pyroxene. The main product mined is chalcopyrite. Other minerals which also

have been mined here include molybdenite, scheelite, and pitchblende. Included in a descriptive list of 28 minerals are allanite, bayleyite, ferrimolybdite and gersdorffite.

R. S. M.

Glaçon (M. J.). *Les minéraux du nickel, du cobalt et du bismuth dans les minéralisations du nord de l'Algérie.* Bull. Soc. franç. Min. Crist., 1958, **81**, 173–175.

Cobaltite, gersdorffite, niccolite, skutterudite, bravoite, bismuthinite, and klaprothite [=lazulite] occur as small crystals enclosed in chalcopyrite and tetrahedrite in late Tertiary metallic veins. Pyrite and ankerite or calcite also are present and accessory minerals include arsenopyrite, chalcostibite, enargite, famatinite, stibnite, sphalerite, and galena. R. A. H.

Glaçon ([M.] J.). *Découverte de cassitérite et de ferbérite dans les filons de Rhar Rouban (Algérie occidentale).* Bull. Soc. franç. Min. Crist., 1958, **81**, 274–275, 2 figs.

Cassiterite, ferberite, and arsenopyrite occur in veins, with quartz, tourmaline, and chlorite, cutting schists. Partial analysis of the ferberite gave WO_3 72·6, FeO 22·8, MnO 1·2. R. A. H.

Geffroy (J.) & Sarcia (J.-A.). *Présence de jordanite dans le district du Djebel-Hallouf (Tunisie).* Bull. Soc. franç. Min. Crist., 1957, **80**, 99–100. E. J. & A. S.

Van Wambeke (L.). *Un nouveau minéral radioactif congolais de l'Ituri : la tanteuxénite. Un cas spécial de détermination par rayons X.* Bull. Soc. belge Géol., 1958, **67**, 121–127.

The tanteuxenite of the R. Liha, tributary of the Ituri, Belgian Congo, has been determined, without preliminary chemical analysis, by a combination of X-ray diffraction and X-ray fluorescence. After recrystallization by heating in air, two components are obtained, one corresponding to rutile and the other belonging to the microlite-pyrochlore series. Chemically the mineral is a tantalate of yttrium rich in titanium, and it is compared with the tanteuxenite of West Australia [A.M. **35**–399]. F. Sch.

Kabesh (M. L.) & Afia (M. S.). *The wollastonite deposit of Dirbat Well.* Sudan Geol. Surv., 1959, Bull. 5, 32 pp., 15 figs.

Pre-Cambrian meta-sediments of the north-eastern Red Sea Hills, Sudan, have been invaded in the neighbourhood of Dirbat Well (20° N., 36°30′ E.) by gabbroic rocks, giving rise to a skarn assemblage. Minerals developed include diopside, grossular, schorlomite, titaniferous vesuvianite, and wollastonite. Wollastonite is the chief constituent and occurs in large masses ; in 38 individual lenses of calc-silicates the total tonnage of wollastonite is estimated to b over 300,000 metric tons. Chemical analyses are given fo wollastonite concentrates, grossular, and hydrogrossula and for ilmenite from the gabbro. Schorlomite and grossula occur together and an analysis of black dodecahedr crystals of schorlomite gave SiO_2 32·87, TiO_2 13·80, Al_2O 6·46, Fe_2O_3 18·54, MgO 0·87, CaO 27·62, [=100·16]. R. A. H.

Coleman (T.). *Gem and mineral collecting in the Transvaal* Rocks and Minerals, 1959, **34**, 114–115.

General descriptions of miscellaneous mineral collectin areas in the Transvaal are given. Various quartz mineral seem to be especially abundant. R. S. M.

Legrand (R.), Lohest (A.), & Raucq (P.). *Occurrence o chromite dans le massif ultrabasique de la Lutshatsh (Kasai).* Bull. Soc. belge Géol., 1958, **67**, 259–264 3 figs.

Chromite is reported in an intrusion composed mainly o enstatite but possessing in its eastern part a marginal zon of serpentine. F. Sch.

Thomsen (Bruno). *On sand samples from the west coast o Greenland I.* Medd. om Grønland, 1957, **157**, no. 2 1–25, 3 figs., 2 pls. [Also as Grønlands Geol. Unders Bull. no. 16.]

The minerals in 41 sand samples from the northern par of Holsteinsborg district, West Greenland, are examine optically. The heavy minerals clearly reflect the averag mineral composition of the country rocks, which all belon to granulite facies. H. M.

Danø (M.) & Sørensen (H.). *An examination of some rar minerals from the nepheline syenites of South Wes Greenland.* Medd. om Grønland, 1959, **162**, no. 5, 1–3 3 figs., 2 pls. [Also as : Grønlands Geol. Unders. Bul no. 20.]

The mineralogy and petrological importance of som minerals from the nepheline syenites of South Greenlan are discussed. The minerals come from the Ilímaussa batholith (Naujakasik, Tuperssuatsiaq, Igdlúnguaq, Kar gerdluarssuk, Tunugdliafik, etc.) and from the Igalik batholith. Optical microscopy, X-ray powder photograph published analyses and crystal data are used. Igalikit gieseckite, and erikite are pseudomorphs. Naujakasit formerly only known from a loose boulder, has now bee found in situ at Tuperssuatsiaq and the northern part the Ilímaussaq batholith. Monazite, britholite, neptunit a 'white mineral', ussingite, and (?) lovozerite are shown t be hydrothermal alteration products. The 'white minera is probably a Na and Nb rich perovskite mineral wit

=3·89Å found at Igdlúnguaq associated with neptunite, pistolite, and analcime. Epistolite is considered isomorphous with murmanite. [M.A. **14**–367] H. M.

Sondam (J.) & Sørensen (H.). *Uraniferous nepheline syenites and related rocks in the Ilimaussaq area, Julianehaab district, southwest Greenland.* Proc. 2nd U.N. Intern. Conf. Peaceful Uses Atomic Energy, 1958, **2**, 555–559, 6 figs., 1 table.

Widespread lujavrites contain 100–200 p.p.m. uranium and 3 to 4 times that amount of thorium, with local concentrations of up to 2300 p.p.m. U and 6000 p.p.m. Th. Steenstrupine, monazite, and a thorianite-like mineral occur in pseudomorphs, probably after eudialyte, in analcime-rich lujavrites and syenite. Poikiloblastic steenstrupine is also developed. Inclusions of recrystallized naujaite (coarse sodalite-foyaite) in the lujavrites contain eudialyte pseudomorphed by analcime, catapleiite, and sometimes a niobium-rich perovskite mineral. Thorianite forms inclusions in steenstrupine crystals associated with the pseudomorphs. [M.A. **14**–367] M. J. G.

VARIOUS TOPICS

Andrushchenko (G. N.).] Андрющенко (Г. Н.). Включения никелевых минералов в кварце Южного Урала. [*Inclusions of nickel minerals in quartz of the South Urals.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, no. 17, 5–10, 3 figs.

A description is given, including the X-ray data, of ersdorffite, millerite, and violarite, found as inclusions in ock crystal and vein quartz. S. I. T.

Tolstikhina (K. I.)] Толстихина (К. И.). К исследованию люминесцирующих включений в слюдах. [*On the study of luminescent inclusions in micas.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, no. 17, 53–56, 1 fig.

As the result of a study of 350 specimens, micas are ivided into five groups with respect to their colour of uminescence. The factors determining luminescence are iscussed. [M.A. **13**–452] S. I. T.

Lemmlein (G. G.)] Леммлейн (Г. Г.). Классификация жидких включений в минералах. [*Classification of liquid inclusions in minerals.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 137–143.

A very elaborate classification of liquid inclusions in rystals, based on genetic factors, is given. S. I. T.

Tokmakov (P. P.)] Токмаков (П. П.). Хрусталеносные кварцевые жилы замещения и хрусталеносные полости перекристаллизации Алдана. [*Rock crystal replacement veins and rock crystal cavities of recrystallization of Aldan.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, no. 10, 49–56, 6 figs.

The study of quartz veins of Aldan, Siberia, supported by chemical and spectrographic analyses, suggests that a distinction should be made between infilling veins and replacement veins or recrystallization veins. The cavities can also be classified as primary, solution, and recrystallization cavities. S. I. T.

[Sheftal (N. N.)] Шефталь (Н. Н.). Генезис пьезокварцевых месторождений в связи с данными искусственного выращивания кварца. [*The genesis of piezo-quartz deposits in relation to the data concerning the artificial growth of quartz.*] Вопросы геохимии и минералогии. Акад. Наук СССР. [Problems of Geochem. & Min., Acad. Sci. U.S.S.R.], 1956, 142–157, 6 figs.

This is an attempt to co-ordinate the results of experimental study of the growth of quartz with the observation of quartz deposits in nature. The factors of pressure, temperature, temperature gradient, circulation, and the presence of a gas phase are discussed. S. I. T.

[Leskevich (I. E.)] Лескевич (И. Е.). Кристаллы кварца в углях. [*Crystals of quartz in coals.*] Доклады Акад. Наук СССР. [C.R. Acad. Sci., U.S.S.R.], 1959, **124**, 575–577, 3 figs.

Small (up to 0·2 mm) prismatic, bipyramidally terminated crystals of quartz are found in a seam of brown coal, 11 metres in thickness, in the Dnieper brown coal basins. The amount of quartz in coal reaches 30%. Small cigar-shaped crystals of quartz are also found in the coal of the Donetz basin. It is postulated that the quartz is of a syngenetic formation with the coal. S. I. T.

[Pirozhnikov (L. P.)] Пирожников (Л. П.). Кристаллы кварца на псевдоморфозе халцедона по древесине с острова Мак-Клинтока (Земля Франца Иосифа) [*Quartz crystals on a pseudomorph of chalcedony after wood from the McClintock Island (Franz Josef Land.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**(3), 338–343, 7 figs. S. I. T.

[Vertushkov (G. N.)] Вертушков (Г. Н.). Влияние силы тяжести на рост и растворение кристаллов в природе. [*The influence of gravity on growth and solution of crystals in nature.*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1958, **87** (4), 469–475, 8 figs.

This is an observation of the influence of gravity on the shape and surface features of beryl, topaz, and calcite.

S. I. T.

[Nikolaev (V. A.)] Николаев (В. А.). К вопросам теории процессов эндогенного минералообразования. [*On the question of the theory of endogenic mineral formation.*] Вопросы геохимии и минералогии. Акад. Наук СССР. [Problems of Geochem. & Min., Acad. Sci. U.S.S.R.], 1956, 109–128, 6 figs.

This is a mathematical treatment of the thermodynamics and phase equilibria of inert and mobile components leading to the formation of minerals. S. I. T.

[Merenkov (B. Ya.)] Меренков (Б. Я.). О просечках в жилах хризотил-асбеста и их генезисе. [*On partings in the veins of chrysotile-asbestos and their genesis.*] Труды института геологии рудных месторождений, петрографии, минералогии и геохимии. [Trans. Inst. Geol. of Ore-deposits, Petr. Min. & Geochem.], 1957, no. 10, 41–48, 14 figs.

Three kinds of partings are distinguished : (1) zone along join of fibres ; (2) pseudo-partings, formed by a serpentine partition between two veins ; (3) partings containing magnetite. It is concluded that the last-mentioned type of parting was formed during the recrystallization of the siliceo-magnesian colloidal gels, which the author calls 'asbogels', leading to the formation of fibrous asbestos. Magnetite was formed from the iron contained in the asbogels. S. I. T.

Van de Steen (J.). *La paragenèse du graphite au Katanga.* Ann. (Bull.) Soc. géol. Belgique, 1957–1958, **81**, B179–193, 3 figs.

The graphite occurs as cryptocrystalline masses or sometimes as flexible scales with a steel-grey, metallic lustre. It is met in the quartzose mica-schists, aplites, more rarely in pegmatites or veins of quartz. Its origin is not magmatic but is connected with carbon pre-existing in the sediments and recrystallized. J. M.

Michot (J.). *Le phénomène magmatique au sein du massif anorthositique de Haaland, Egersund* (*Norvège*). Ann. (Bull.) Soc. géol. Belgique, 1954–1955, **78**, B247–266, 6 figs., 1 photo.

Petrographical descriptions of one pale and two dark types of leuconorite are given. From this examination together with a study of anorthositic enclaves in the leuc norite the existence of a magmatic phase of leuconorit composition within the anorthosite body is deduced. Th phase was produced after the emplacement of a more less coarsely crystallized anorthositic rock and after t folding. An anatectic origin of the leuconoritic magma envisaged. J. M.

Michot (P.). *Les gisements de minerais noirs de la régi d'Egersund.* Ann. (Bull.) Soc. géol. Belgique, 195 1956, **79**, B183–202, 6 figs.

The deposits in the region of Ekersund [Norway] a of two kinds : irregular and subparallel groups of fair continuous veins associated with a calc-ferromagnesi metasomatic front ; and veins of little extent which repr sent the final liquor at the end of crystallization of a leuc norite. Hypersthene is associated with the dark mineral ilmenite and magnetite. J. M.

Hubaux (A.). *Differents types de minerais noirs de la régi d'Egersund* (*Norvège*). Ann. (Bull.) Soc. géol. Belgiqu 1955–1956, **79**, B203–215, 2 pls.

The minerals are hematite, ilmenite, magnetite, spin There are 4 groups : (1) hematite–ilmenite, with hemati varying from 10 to 50% by volume, a variety contai magnetite ; (2) homogeneous ilmenite, without magnetit (3) spinel–magnetite, with ilmenite, spinel forming up 3% by volume ; (4) ilmenito–magnetite. The black miner are everywhere later than the other minerals. J. M.

Michot (P.). *Un nouveau type d'association anorthosit norite dans la catazone norvégienne* (*Egersund*). An (Bull.) Soc. géol. Belgique, 1956–1957, **80**, B449–46 2 figs., 2 photos.

The association is an alternation of finely gneisso ribbons and layers of anorthosite and norite, and is formation intermediate in character between anatectic a metasomatic masses. J. M.

Michot (P.). *Les plagioclases du massif anorthosito-noritiq de Haaland, Egersund* (*Norvège*). Ann. (Bull.) So géol. Belgique, 1957–1958, **81**, B425–440, 4 figs., photos.

One type of plagioclase is slightly elongate (3–4 mm sometimes longer) and occurs in the anorthosite. A secon type is in equant plates less than 2 mm ; it is associate with hypersthene, opaque mineral, and diopside and form a dark leuconorite. The composition of the two types is t same (40–50% An). Their development is related to tw different processes, the one to metamorphic differentiatio the second to leuconoritic anatexis. J. M.

ENDL (A.) & MÁNDY (T.). *Über die blaue Farbe einiger Mineralien.* Acta Min.-Petr. Univ. Szeged, 1958, **11**, 61–67.

In the allochromatic group of coloured minerals the ions oducing the colour effect enter the lattice by isomorhous substitution or by occupying vacant sites. Blue and een colours of such minerals as calcite, kyanite, anhydrite, id celestine depend on the presence of ferric and ferrous on. Precise analyses showed $FeO : Fe_2O_3$ between 0·95 id 4·1, that is, in the range 1·0–9·0 found by McCarthy s significant for blue coloration. The total iron of blue ck salt from Stassfurt is only $5{\cdot}10^{-5}\%$ and the colour nnot be due to the iron content ; an explanation based on adioactivity is satisfactory. J. Ph.

AMES (T. C.). *Hot springs investigation : progress report.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 46.

Fourteen hot (80–135°F) springs, evolving a mixture of $_2$, He, and CO_2, are known in volcanic regions or near cent faults. The Nyamosi Hot Spring evolves gas with 8% He ; Maji Moto (Musoma) 13% He ; and Songwe Mbeya) 99·2% CO_2. D. McK.

ICKIE (D.). *A note on the application of the phase rule to the recovery of salt from brines.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 76–84.

The phase rule is applied to the problems of calculating he maximum amount of halite that can be extracted from atural brine by solar evaporation and of recognizing when he residual brine will no longer crystallize pure NaCl. lgebraic expressions for calculation of the yield are based n data for the 5-component system $NaCl–Na_2CO_3–NaHCO_3–Na_2SO_4–H_2O$, where graphical methods break own. Brines from Ikasi, central Tanganyika, are conidered in illustration ; analyses of 7 brines are given. J. Ph.

AMES (T. C.). *Analyses of natural gases and accompanying spring waters up to 1956.* Rec. Geol. Surv. Tanganyika, 1958, **6**, 100–102.

Eleven analyses of hot-spring gases and accompanying waters are recorded with temperature and flow data. Gases ary from CO_2-rich (97·2%) to N_2-rich (94·6%). Waters are ich in CO_3^{2-} and HCO_3^-. D. McK.

ESPUJOLS (J.). *Contribution a l'étude de la structure mosaïque dans certains cristaux de quartz. I. Étude experimentale.* Bull. Soc. franç. Min. Crist., 1957, **80**, 453–482, 15 figs. *II. Étude théorique de la réflexion des rayons X par un réseau cristallin perturbée.* Ibid., 483–504, 3 figs.

Variations in the reflecting power of quartz crystals to X-rays have been noted and studied. These variations are related to defects in the crystals examined by other techniques, the defects being tentatively identified with dislocations. From theoretical considerations it is shown that from the point of view of X-ray diffraction a network of dislocations is equivalent to the division of the crystal into small perfect blocks, each acting on the X-rays independently of one another. R. A. H.

MICHOT (P.). *La diffusion dans le processus de sécrétion latérale.* Ann. (Bull.) Soc. géol. Belgique, 1957–1958, **81**, B159–177, 3 figs.

A description of veins of quartz, chlorite, and sericite in the ottrelite-bearing phyllites and the siliceous phyllites of the higher zones of the Upper Salmian, at Vielsalm (Belgium). The veins are formed by a process of lateral secretion, and their formation depends on the speed of diffusion of the elements of which they are composed, this speed being itself dependent on the rapidity of deformation of the surrounding rock. J. M.

VARLAMOFF (N.). *Zonéographie de quelques champs pegmatiques de l'Afrique Centrale et les classifications de K. A. Vlassov et de A. I. Guinsbourg.* Ann. (Bull.) Soc. géol. Belgique, 1958–1959, **82**, B55–87, 3 figs.

The author reviews the classifications of Vlassov and of Ginsburg and compares them with his own. Earlier ideas must evolve as new facts are established and brought forward, notably by the conception of the zoneographic distribution of the types of pegmatite around granitic masses. [M.A. **14**–43, 212] J. M.

SEARLE (E. J.). *A note on the formation of native iron and other effects associated with contact of basalt and carbonized wood at Auckland, New Zealand.* New Zealand Journ. Geol. Geophys., 1958, **1**, 451–458, 5 figs.

The basalt surrounding a tree mould in a flow from Mt. Wellington, Auckland, is shown to contain native iron as platy or wiry blebs occasionally surrounded by magnetite. The basalt is described petrographically and an analysis by J. A. Ritchie given. The probable mechanism of production of the native iron by reduction from crystallized magnetite or from ferric ions in the lava is discussed. Shrinkage cracks in the charcoal within the tree mould have been invaded by an alkali-rich residuum of the basalt. W. A. W.

[BAZHENOV (I. K.), INDUKAEV (Yu. V.), & YAKHNO (A. V.)] Баженов (И. К.), Индукаев (Ю. В.) и Яхно (А. В.). Самородное железо в габбро-долеритах р. Курейки (Красноярский край). [*Native iron in gabbro-dolerites of the Kureyka (Krasnoyarsk region).*] Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88** (2), 180–184, 6 figs.

Native iron is found in olivine gabbro-dolerites as individual grains or masses and bands up to 2 cm in thickness. On chemical analysis it gave Fe 97·62, Ni 0·27, Co 0·12, Mn 0·12, Ti tr., Cu 0·21, P abs., S 0·03, Cl tr., Si tr., sp. gr. 6·83, H. ≈ 4, magnetic, sol. in HCl ; often associated with ilmenite or mantled by pyrrhotine and cohenite. Order of crystallization of minerals in the dolerite is : ilmenite and silicate minerals—pyrrhotine and chalcopyrite—native iron and cohenite—epidote and chlorite. It is tentatively suggested that native iron was formed as the result of reduction processes promoted by the organic matter absorbed by the magma from the surrounding coal seams and bituminous shales. S. I. T.

Michot (P.). *La géologie des zones profondes de l'écorce terrestre.* Ann. (Bull.) Soc. géol. Belgique, 1956–1957, **80**, B19–59, 6 figs.

A presidential address studying plastic deformation, igneous phenomena in relation to depth, basic magmatism, granite and granitizing activity, their relations during tectogenic development and their variations as a function of the depth of evolution. The author puts forward the principle of basic (leuconoritic) anatexis in the lower catazone and shows its importance in the production of anorthosite domains in the lower part of the tectogens. The existence of an anorthosite layer of planetary extent may be assumed in the lower part of all the continental masses, and it would be identified with the basaltic or intermediate layer of the seismologists. The surface thus dividing the sial into 2 layers could be called the 'sical discontinuity'. J. M.

Snel (M. J.). *Note sur la constitution géologique de la région de Bukavu.* Bull. Serv. géol. Congo Belge, 1955, **6**, fasc. 3, 7 pp., 4 figs.

The Palaeozoic rocks of the Urundi system in the region to the south of Lake Kivu suffered prolonged erosion before being overlain by widespread trachyte flows. The latter were partly eroded, and then covered by numerous flows of basalt of fissure origin, each flow being of small lateral extent. The basalt flows were interspersed with periods of erosion : a late Quaternary age has been assigned to the intraformational alluvial deposits in the basalts. R. A. H.

Aleva (G. J. J.). *Chemical and mechanical analysis of a tropically weathered granitic rock.* Kon. Ned. Geol.-Mijnbouwk. Genootschap, Geol. Ser., 1956, **16** (Gedenkboek H. A. Brouwer), 1–11, 5 figs., 1 pl.

A section of weathered granitic rock in north-west Billiton, Indonesia, varying from porphyritic microgranite to completely disintegrated soil, has been studied. The results of chemical analyses are given for seven specimens together with the results of mechanical analysis of the thr most weathered specimens. Under these humid tropic conditions potassium disappears quickly, allowing th production of potassium-free minerals such as gibbsite an kaolinite. The relative immobility of magnesium is co spicuous but not explained. The grain size distributio of the quartz are discussed. R. A. H.

Wéry (A.). *Sur la constitution lithologique de quelqu charbons du bassin houiller d'Andenne.* Publ. Asso Etude Paléont. Stratigr. Houillères, Brussels, 195 no. 21, 229–259, 3 figs., 2 pls. R. V. T.

Monseur (G.). *Propos sur l'antraxolite de Visé.* Ann. (Bull Soc. géol. Belgique, 1955–1956, **79**, B219–231.

Max Lohest (1884–1912) considered the anthracite Visé (Belgium) to be of animal origin (by oxidation hydrocarbons). Dunn and Fisher attribute a vegetab origin to the anthraxolite of the Mohawk Valley (by ca bonization at low pressure and temperature) [M.A. **12** 560]. There is no evidence at Visé which might invalidat the theory of Lohest, and there is little probability tha the 'anthracite' of Visé is of vegetable origin. J. M.

[Petersilie (I. A.)] Петерсилье (И. А.). Углеводородны газы и битумы интрузивых массивов центральной част Кольского полуострова. [*Hydrocarbon gases and bitume of intrusive masses in the central part of Kola peninsula* Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sc U.S.S.R., Geol. Ser.], 1959, **1**, 56–62, 2 figs.

Amplification of a previous paper. [M.A. **14**–232] S. I. T.

Baur (Gretta S.), Larsen (Willard N.), & Sand (L. B. *Image projection by fibrous minerals.* Amer. Min 1957, **42**, 697–699.

Transverse sections of fibrous aggregates of ulexit project an image of an object against one surface to th opposite surface. This occurs by successive reflections a the fibre interfaces, and was observed also with fibrou trona and halotrichite. J. Z.

[Cherdyntzev (V. V.) & Suyarova (O. V.)] Чердынце (В. В.) и Суярова (О. В.). Некоторые данные о влияни геологических условий на формирование нейтронног потока Земли. [*Some data on the influence of geologica environments on the formation of the earth's neutron flux.* Изв. Акад. Наук СССР, Сер. Геол. [Bull. Acad. Sci U.S.S.R., Geol. Ser.], 1959, **2**, 115–119.

The measurement of alpha particle traces on photographi plates placed in different parts of beryllium-bearing peg matites and hydrothermal veins in the region of Alma-Ata

ntral Asia, did not show any increased neutron flow, cept in one area of beryllium ores of high activity. This ssumed to be due to the strong flow of alpha particles d to the presence of material capable of producing utrons. S. I. T.

YTHORPE (S. N.). *Optical properties of 'cellophane'.* Nature, 1957, **179**, 322.

One thickness of variety called 'Styrafoil' (refr. inds. 588 and 1·594) produces a retardation of 1/8 λ_{Na}. It is ggested that a step wedge of this material would provide satisfactory alternative to a quartz wedge.

C. J. E. K.

AMAR (J. E.) & SHRODE (R. S.). *Water soluble salts in limestones and dolomites.* Econ. Geol., 1953, **48**, 97–112.

Samples of representative Illinois limestones and dolo-ites were ground in distilled water and the amount of ater-soluble salts in the resulting leaches determined by emical analysis. The dolomite leaches contained more luble salts on an average than the limestone leaches d commonly contained more Mg^{2+}, HCO_3^- and Cl^-. ne limestone leaches generally exceeded the dolomites in a^{2+} and SO_4^{2-}. X-ray diffraction data showed the leach lids from limestones to be generally characterized by the esence of $CaSO_4$, $CaCO_3$, and NaCl. The dolomite leach lids are $MgCl_2$ and basic $MgCO_3$; $MgSO_4$ and KCl are und more commonly than in limestone leach solids. The aches from dolomites are generally more basic than those om limestone. The calcium sulfate in the leaches may me largely from the solution of inter-crystal deposits, it the other salts probably come mostly or entirely from tra-crystal fluid inclusions. These inclusions are smaller it more numerous in the dolomites than in the limestones.

W. A. Wh.

UTTON (D. A.), MIDDLETON (M. D.), & BODY (R. A. F.). *Reaction of some silicates with chelating agents.* Nature, 1959, **183**, 99–100, 1 fig.

In connection with pneumoconiosis studies the rate of eakdown of the silicate structure when treated with DTA was investigated for olivine, crocidolite, antigorite, rysotile, talc, orthoclase, and tricalcium silicate.

C. H. K.

ES (RONALD L.). *Crystal therapy in the American south-west.* Rocks and Minerals, 1958, **33**, 10–11.

This is a summary of the use of mineral substances in e healing rituals of Indian groups in southwestern United ates and northwestern Mexico. Substances commonly pployed in these ceremonies are rock crystal, topaz, lcite, garnets, malachite, azurite, concretions, and shells.

R. S. M.

SCHALLER (W. T.) & VLISIDIS (A. C.). *Spontaneous oxidation of a sample of powdered siderite.* Amer. Min., 1959, **44**, 433–435.

A sample of siderite, ground and analysed in 1915, contained 59·42% FeO. In May, 1958, the stored powder contained 0·74% FeO. The grinding of the sample probably caused the spontaneous oxidation to hematite.

B. H. B.

PATTON (LEROY T.). *Rosewal method of petrographic analysis in legal work.* Rocks and Minerals, 1957, **32**, 345, 384.

An illustration of the use of the Rosewal method of petrographic analysis in a legal action involving the contraction of silicosis from shale in a coal mine; discussion of the advantages of this method in such work. R. S. M.

JAHNS (R.). *Formations of minerals—Physical properties.* Gems & Gemology, **9**, 240–247, 271–279.

The continuations of an earlier article on the structure of matter by the same author. J. A. H.

PAIDASSI (J.). *Sur la croissance en aguilles de la phase hematite dans les pellicules d'oxydation du fer aux temperatures élevées.* Acta Metallurgica, 1958, **6**, 778–780, 4 figs.

A description is given of the growth of hematite needles from an iron oxide film at temperatures of 700–750°C.

R. G. Wls.

WASHBURN (J.). *Experimental observations concerning the collapse of dislocation loops during annealing.* Journal of Metals, 1956, **8**, 189–191, 2 pls., 2 figs.

The *c*-axis indentations in zinc crystals were shown to undergo 100 per cent. strain recovery on heating. The mode of deformation and the details of the polygonization and collapse of indentations were found to be consistent with a number of predictions of dislocation theory.

R. G. Wls.

SOMMER (A. W.) & KELLOGG (H. H.). *Oxidation of sphalerite by sulfur trioxide.* Trans. Metallurgical Soc. AIME, 1959, **215**, 742–744, 2 figs., 1 table.

SO_3–O_2 mixtures react with sphalerite at an appreciable rate in the temperature range 361° to 527°C to form $ZnSO_4$. The rate of reaction follows a parabolic law. Oxygen, or O_2–SO_3 mixtures have a negligible effect on sphalerite in the same temperature range. R. G. Wls.

COLEMAN (ROBERT G.). *The natural occurrence of galena-clausthalite solid solution series.* Amer. Min., 1959, **44**, 166–175, 1 fig.

Studies of the sulfides associated with the vanadium-uranium deposits of the Colorado Plateau show that a complete natural solid solution series between galena (PbS) and clausthalite (PbSe) exists. Twenty samples ranging from 0·04–93·7 molecular per cent PbSe in PbS were analyzed. The unit cell varied from 5·930 to 6·127Å. A plot of the unit cell versus the molecular per cent of PbSe in PbS for the galena-clausthalite series was made. A linear relationship was assumed. The samples closely approximated this hypothetical linear plot and therefore strongly suggest that a complete isomorphous series PbS–PbSe exists in nature. A. C. H.

Hutton (C. O.). *Metamict tantalite from Western Australia.* Nature, 1957, **180**, 248.

The so-called manganomossite from Yinnietharra gives a powder pattern of the columbite-tantalite series after heating for 1 hour at 1200°C in vacuo. Unheated the powder pattern exhibits a few faint lines and single crystal reflexions are weak and streaked. This is the only metamict tantalite on record. D. McK.

Arrhenius (G.), Bramlette (M. N.), & Picciotto (E.). *Localization of radioactive and stable heavy nuclides in ocean sediments.* Nature, 1957, **180**, 85–86.

Skeletal fish debris of Late Pleistocene to Recent age has high concentrations of radioactive elements and rare-earths, 0·6–1·5% Zn, 0·1–0·5% Cu, 0·05–0·15% Sn, and 0·03–0·1(Pb. Heavy metal contents of present day bathypelagic f are much lower, and concentration appears to have tak place after death, radioactive and other heavy metals be sorbed to the surface of the microcrystalline apatite skeletal debris. D. McK

Legrand (R.). *Brèches radioactives aux environs de Vi* Bull. Soc. belge Géol., 1957, **66**, 211–217, 4 pl.

Breccias of dissolution occurring under Namurian se ments near Visé, Belgium, are famous for their iron ph phate mineralization (delvauxite, koninckite, richellite) a show radioactivity equivalent to 1°/$_{oo}$ U. F. Sch.

Ukai (Y.), Kawakami (T.), & Kimura (Y.). *The relati between the minute quantity of uranium in zircon and mineralogical characters.* Journ. Min. Soc. Japan, 19 **3**, 722–737, 6 figs. (In Japanese ; English summa ibid., 805–806).

The U content of zircon from weathered granite w determined by the microfluorimetric method, and the co tent of 32 other trace elements semi-quantitatively dete mined spectrographically. The first intrusion of gran was rich in zircons which had a low U content, while t final granite intrusion had only moderate amounts zircon in which U varied from small to large amounts. R. A. H.

ABBREVIATIONS AND SYMBOLS

used in the text of abstracts

M.M. .. Mineralogical Magazine : M.A. .. Mineralogical Abstracts : A.M. .. American Mineralogist

CHEMICAL & PHYSICAL-CHEMICAL

cation-exchange-capacity	c.e.c.
differential thermal analysis	d.t.a.
equivalent U_3O_8	eU_3O_8
ethylenediaminetetra-acetic acid	EDTA
heat of formation (absolute temperature subscript)	ΔH_t
ionic potential, e.g.	pH
insoluble residue	insol. res.
isotopes, e.g.	^{40}A, ^{40}K
loss on ignition	ign. loss
milliequivalent	me.
microgramme	µg
million-years	m.y.
not determined	n.d.
not found	nt. fd.
not present	nil
parts per million	p.p.m.
strength of solution, normal	*N*
— — — molar	*M*
substances in ionic state	
anions, e.g.	Cl^-, SO_4^{2-}
cations, e.g.	K^+, Fe^{2+}
valency, e.g.	Cl^I, Fe^{II}, Fe^{III}

CRYSTALLOGRAPHIC & STRUCTURAL

Ångstrom unit (10^{-8} cm)	Å
crystal axes	*a*, *b*, *c*
— face indices	(hkl)
— form indices	{hkl}
— zone indices	[hkl]
indices of X-ray diffractions	hkl
intensity,	*I*
— relative	I/I_0
interplanar spacing	*d*
mica structural polymorphs	$1M_1$, $2M_1$
Siegbahn units	kX
space group. These words will be written in full	
unit cell, formula units	*Z*
— — repeat distances	*a*, *b*, *c*
— — reciprocal lattice lengths of edges	a^*, b^*, c^*
— — interaxial angles direct lattice	α, β, γ
— — — — reciprocal lattice	α^*, β^*, γ^*

OPTICAL

dispersion, e.g.	$r > v$
extinction angle, e.g.	$\gamma : c$
optic axial angle	2V
— — plane	O.A.P.
refractive index, in text	refr. ind.
— — of isotropic mineral	n
refractive indices	
of uniaxial mineral	ω, ε
of biaxial mineral	α, β, γ
sign of biaxiality	
negative	$-$ or $2V_\alpha$
positive	$+$ or $2V_\gamma$

PHYSICAL (*other*)

calorie	cal.
calorie, large	kcal.
cycles per second	c/s
degree centigrade	°C
density	*D* (quote units)
— , relative, e.g.	D_4^{20}
gramme	g
hardness	H.
melting-point	m.p.
micron (10^{-4} cm)	µ
millimicron (10^{-7} cm)	mµ
pounds per square inch	lb/in^2
soluble	sol.
specific gravity, terms of reference not known	sp. gr.
wavelength	λ

SYMBOLS

approximately equal to	$\approx$
equal to	$=$
equal to or greater than	$\geqslant$
equal to or less than	$\leqslant$
greater than	$>$
less than	$<$
not equal to	$\neq$
parallel to	$\parallel$
per cent.	%
per mille	‰
perpendicular to	$\perp$
proportional to	$\propto$

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